

A collage of military images featuring the Marine Corps Warfighting Lab logo. The logo is a shield with a green dragon head and the text "MARINE CORPS" and "WARFIGHTING LAB". The collage includes images of helicopters, soldiers, a landing vehicle, and a tank.

EXPERIMENTATION CAMPAIGN PLAN: 2003
31 January 2003




**UNITED STATES MARINE CORPS
MARINE CORPS WARFIGHTING LABORATORY
MARINE CORPS COMBAT DEVELOPMENT COMMAND
QUANTICO, VIRGINIA 22134-5096**

IN REPLY REFER TO
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Plans ECP
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From: Commanding General
To: Distribution List

Subj: Marine Corps Warfighting Laboratory Experimentation Campaign Plan (ECP) 2003

1. This document provides a conceptual framework for Marine Corps experimentation supported by the Marine Corps Warfighting Laboratory. It is intended as a guide to the range of both Service experimentation and Marine Corps in support of Joint experimentation initiatives currently underway with Lab support. In this regard, it is formatted to permit rapid modification of individual sections and initiatives with currency indicated by dates in the upper right hand corner of each page.
2. The overall direction of experimentation with the Lab is in concert with my guidance which is summarized below:
 - Sea Viking 2004 (SV04) will be our overarching focus.
 - We will think in terms of STOM in everything we do.
 - Our technical experimentation will follow the path of EMW/STOM.
 - Establish appropriate linkage with JFCOM.
 - Our efforts should be linked to a concept and a transition.
3. The ECP is organized into individual sections to permit ready reference to specific areas:
 - Section I provides a general description of the Lab's mission, innovation and experimentation process.
 - Section II discusses each of the major Service experimentation areas. These areas are intended to focus Service experimentation in support of the Marine Corps Title X responsibilities to organize, train and equip Marine Corps expeditionary forces.
 - Section III contains a compendium of Lab experimentation initiatives, grouped by Service Advocate, that describes the experimentation goals and milestones for Lab supported experimentation initiatives.
 - Section IV describes the Lab's efforts to exploit experimentation results.
4. My intent is to publish an updated Experimentation Campaign Plan annually. However, in view of the pace of change within experimentation, recommendations for changes to this Campaign Plan are solicited at anytime. Forward comments and recommendations to the Commanding General, Marine Corps Warfighting Laboratory (Attn: Director, Experiment Plans Division).


Frank A. Panter
Brigadier General, USMC

Distribution:
Lists A&B and All Hands at MCWL

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OVERVIEW

Why a Marine Corps Warfighting Laboratory?

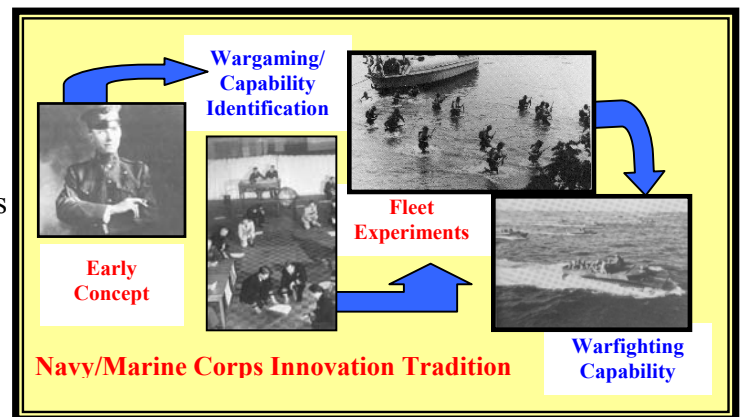
In a world of great uncertainty, rapid technological diffusion, and potentially volatile conflict, it is vital that the Marine Corps aggressively explore new operational concepts, innovative organizational designs, and advanced technologies to meet tomorrow's challenges. The Marine Corps has a rich legacy of innovation including; amphibious warfare, close air support, maritime prepositioning, and tilt-rotor technology, but cannot rest on its laurels or current capabilities.

The emerging security environment places a premium on a continuous transformation of capabilities in order to maintain our competitive advantage over potential adversaries. Potential adversaries can seek out asymmetric tactics, or elect to confront U.S. forces in complex terrain, such as dense urban settings to offset American technological advantages. The future suggests that U.S. military preeminence could be short lived unless we stretch the competitive boundaries of existing capabilities or develop entirely new competencies that distinctly alter future military operations.

To ensure that the Marine Corps was prepared for the 21st Century, General Charles C. Krulak, created the Commandant's Warfighting Lab, back in 1995. Chartered to serve as an engine of change and the focal point for innovation, the Lab is a key component of the Marine Corps transformation effort.

It employs wargaming, simulation, and operational experimentation to test and

validate technologies, concepts, and different organizational structures that result in increased capability. It also provides support to the Operating Forces to enhance the tactics, techniques and procedures used within today's force to extend and enhance current capabilities.



In short, the Lab operationalizes the Commandant's goals, stated in *Marine Corps Strategy 21*, to harness innovation and technology to ensure future Joint Force Commanders (JFC) have the necessary naval expeditionary capabilities they need.

Mission. The mission of the Marine Corps Warfighting Laboratory is as follows:

(The Lab) conducts concept-based experimentation to develop and evaluate tactics, techniques, procedures and technologies in order to enhance current and future warfighting capabilities.

Experimentation is conducted to meet Service *Title X* responsibilities. Service experimentation supports the Warfighting Advocates – Command Element, Ground Combat Element, Aviation Combat Element, and Combat Service Support Element – with the results supporting the Marine Corps Expeditionary Force Development System (EFDS)—the process by which the Marine

Corps translates concepts into fielded combat capabilities.

Joint experimentation is supported through the Marine Corps Combat Development Command's Joint Operations Center (JOC), the assigned lead for Marine Corps participation in Joint Forces Command's (JFCOM) joint experimentation program.

History

Established in October 1995, the Lab quickly established itself as a focal point for revolutionary ideas and innovation. Within 18 months, the Lab had developed a means for looking at change – called the *Sea Dragon Process*.

A major component of this process was a five-year experimentation plan – the Warrior Experimentation Series – each phase was intended to last approximately two years in length, culminating in an Advanced Warfighting Experiment (AWE). Each phase was given a title – *Hunter Warrior*, *Urban Warrior*, and *Capable Warrior* – reflecting the conceptual focus of the phase of the experimentation.

In 1997, the Lab executed *Hunter Warrior* as its initial major Advanced Warfighting Experiment involving West Coast Navy and Marine operational forces. This phase examined a number of concepts and issues related to sea-based power projection using emerging information technology, precision indirect weapons and dispersed ground units in an extended battlespace.

Beginning in 1997, the *Urban Warrior* experimental phase focused on the implications of information technology and new tactics in operations in urban environments. The culminating event of this

phase was a major urban experiment in Oakland, CA in the summer of 1999.

The *Capable Warrior* phase culminated in the summer of 2001 with an experiment in conjunction with the *Extended Littoral Battlespace Advanced Concept Technology Demonstration* to explore the impact of emerging broadband wireless technologies, intelligent agent decision support tools, and collaborative decision-making systems on sea-based operations in an extended battlespace with multiple maneuver units.

In 2002, the Lab executed *Millennium Dragon 2002* (MD 02). MD02 supported the Marine Corps service contribution to JFCOM's *Millennium Challenge 2002* experiment. MD02 was conducted from 24 July to 15 August 2002 at MCB Camp Pendleton and at the former George AFB, Victorville, CA. The Lab conducted three experiments during the I Marine Expeditionary Force STOM operation, then executed seven days of limited objective experiments, and finally conducted a 96-hour urban combined-arms experiment. Experimentation focused on urban reconnaissance, surveillance and target acquisition; emerging command, control and communications capabilities; a lighter and more robust surgical care facility collocated with the battalion aid station; and an infantryman's combat identification system.

Since completion of MD02, the Lab has been focused on two experimentation goals: (1) assisting the Operating Forces in implementing the results of MD02 – specifically Basic Urban Skills Training – and (2) preparing for the Sea Viking 04 Advanced Warfighting Experiment to be conducted during the last quarter of 2004 on the West Coast.

The Dragon as a Symbol of Change

Since its inception, the Lab has adopted the *dragon* as its unique emblem representing the Lab's commitment to an open exploration of change. The *dragon* has appeared within each successive logo used by the Lab. Its perhaps apocryphal source is that of an ancient Chinese proverb about change:



Change is like a dragon. You can stand in its way, in which case it will destroy you with its power. You can run from it, in which case it will rapidly overtake and bury you. Or you can jump on its back, and let it take you where it will into the future.

The *dragon* has been used throughout the history of the Lab in the nicknames for Lab-specific technologies such as the *Dragon Drone*, *Dragon Eye*, and *Dragon Warrior* unmanned aerial vehicles, the *Dragon Fire* advanced mortar system, and the *Dragon Runner* unmanned ground vehicle.

Organization

The Lab has been organized to provide core competencies of experimentation, wargaming, technology development and a think tank in

support of its innovation and experimentation mission.



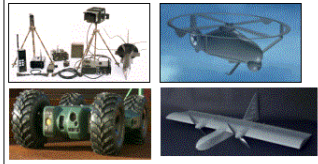
Core Competencies



Experimentation



Technology Development



Wargaming

The Wargaming Program is a comprehensive and innovative effort focused on advanced policy, concept, and operational exploration at several levels.



"Think Tank"



Identify emerging threats, explore concepts, and determine capabilities and solutions to meet future challenges

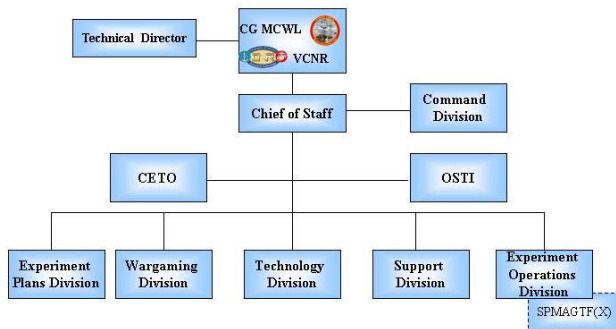
The Experiment Plans Division determines the concept or ideas for change, the Wargaming Division refines the concept and provides capability insights, the Technology Division identifies equipment and technology candidates for experimentation, the Experiment Operations Division conducts detailed planning and executes experiments, and the Support Division assists both in planning and execution.

The Operations Division is dual assigned as a Special Purpose Marine Air-Ground Task Force, Experimental (SPMAGTF (X))—command element capable of assuming command of operational forces during experimentation.

The Office of Science, Technology, and Integration (OSTI). The OSTI oversees the Marine Corps Science and Technology Process aimed at enhancing the warfighting capabilities of the Marine Corps. It develops the vision, policies, and strategies to exploit scientific research and technology development. It integrates and focuses the Science and Technology (S&T) efforts in support of experimentation and the EFDS.

In addition, OSTI is developing and managing the Lab's Science & Technology Operations Information Center (STOIC). STOIC is a computer-based system, which has the look and feel of a Web Site, and will allow the Lab to manage its initiatives, experiments, funding, and share information from a central, Internet-enabled application.

MCWL Organization



The Center for Emerging Threats and Opportunities (CETO). The CETO is a Congressionally mandated organization conducted in partnership between the Lab and the Potomac Institute for Policy Studies. It is chartered to identify emerging threats, explore concepts, and determine capabilities and solutions to meet future challenges in coordination with the Operating Forces and make recommendations to CG MCWL as to emerging capabilities that are candidates for transition to the Expeditionary Force Development System. Current efforts are: Anti-Terrorism/Force Protection/Homeland Defense, Enhanced Blast Effect Weapons study, and issues of special interest to the senior leadership of the Marine Corps such as options for organizing the Marine Corps in MAGTFs, an Operational Assessment of the Taiwanese Marine Corps, and Child Warriors.

Project Albert

Project Albert is a research effort to assess the general applicability of complex adaptive systems to land warfare, and to provide new methodologies for investigating the results of running such models, and incorporating those results with other, more traditional, methods of analysis.

While models based on the theory of complex adaptive systems (called distillations) are intentionally simple, they have the potential to provide insight into evolving patterns of macroscopic behavior that result from collective interactions of individual agents. Operational Synthesis and Data Farming are concepts whose goals are to explore a particular distillation's possibility space, and incorporate those results into the next 'layer' of analysis. The following topic areas represent some of the sub-components of Project Albert:

- Data Visualization, Nonlinearity, Intangibles, and Coevolution
- Prototyping Models and Techniques for Understanding Warfare
- Decision Making and Command Processes

Vice Chief of Naval Research. In 1998, the Commanding General of the Lab was assigned the additional responsibility as Vice Chief of Naval Research and assumed a major role in oversight of Marine Corps related Naval Science and Technology.

Joint Experimentation Support

Based on the need to balance competing demands the Lab is guided by the philosophy below.

The Marine Corps experimentation philosophy is targeted at producing the right mix of Marine Corps capabilities for the Joint Force Commander. The key to producing the right

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mix of capabilities is to ensure that Marine Corps capabilities support joint concepts and where appropriate embed or merge Title X requirements and processes with Joint venues and processes. The goal of this integrated approach is to produce complimentary service and joint Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities (DOTMLPF) recommendations.

Based on this philosophy the Lab examines the direction of United States Joint Forces Command's experimentation to identify those unique future Marine Corps capabilities that have the potential to contribute to Joint capability development.



Experimentation Philosophy

"Right Mix for the Joint Force Commander"



The primary support to Joint Experimentation is conducted within Marine Corps Wargaming Division as part of the Title X wargaming effort.

Areas of Efforts

The Lab has organized its efforts into in order to focus experimentation in areas of effort that reflect both Service-specific and Marine Corps contributions to future Joint warfighting capabilities.

Each Area of Effort is addressed in detail within Section II.

Areas of Effort

- **Command and Control/Information Technology (C2IT)**
- **Reconnaissance, Surveillance, and Target Acquisition (RSTA)**
- **Fires and Maneuver**
- **Logistics**
- **Wargaming**
- **Emerging Threats and Opportunities**

The Marine Corps Warfighting Laboratory is a focal point for exploring future warfighting concepts and experimentation in support of both the Marine Corps and the Joint Concept Development and Experimentation process. As the Marine Corps adapts to the challenges and uncertainties of the 21st century, it must continuously evolve today's highly capable expeditionary forces and aggressively explore new ideas and advanced technologies that contribute to transformational breakthroughs via rigorous experimentation.

Innovation and Experimentation Process

The Innovation and Experimentation (I&E) Process describes the procedures for experimentation development from beginning to end. Each experiment is different. The I&E process organizes experimentation into manageable and logical steps. It provides a schematic appreciation of the steps required to formulate an experiment through transition of the results into the Expeditionary Force Development System (EFDS). A detailed description of the I&E process is available on the Lab's web site at:

<http://www.mcwl.quantico.usmc.mil/document/I&Eprocess.pdf>

MARINE CORPS SERVICE EXPERIMENTATION OVERVIEW

Background. The Experimentation Campaign Plan's (ECP) service experimentation efforts are guided by inputs from Defense Planning Guidance, CMC Vision, Advocates, Marine Combat Development Command, Office of Naval Research and a variety of other sources. The Marine Corps Requirements Oversight Council (MROC) approves the Warfighting Lab's ECP plan annually.

Command & Control and Information Technology. The Lab is exploring Navy and Joint partnerships to develop Over the Horizon (OTH) communications capabilities and On the Move Digital Combat Operations Centers that will enable Ship to Objective Maneuver (STOM). The Lab will continue to develop Decision Support and Common Tactical Picture tools that will integrate into emerging joint collaborative tools and Common Relevant Operational Picture (CROP) capabilities.

Initiatives include enhancements to Marine Expeditionary Unit (MEU) and infantry battalion Digital Combat Operations Centers (DCOC) to include: standard operating procedures, development of a common tactical database for existing tactical data systems, and on the move surface and airborne COC platforms. Communications initiatives will examine on the move/over the horizon communications between a seabased MEU and subordinate elements operating ashore. This initiative seeks to modify existing point-to-point satellite capabilities into a netted voice and digital tactical communications system. The Lab will also continue to examine squad level

communications as well as the potential of transmitting voice communications over existing data networks.

Reconnaissance, Surveillance, Target Acquisition (RSTA). The Lab will examine RSTA tactics, techniques and supporting technologies beginning with the infantry battalion and building to MEB capabilities that integrate into Navy and Joint sensor grids. To develop the RSTA system the lab is examining two components: The networked tactical RSTA grid designed to prevent surprise and provide mutual support for the Marine commander and the Common Tactical Picture (CTP) providing a current comprehensible visual depiction of a prescribed battlespace. Experimentation will assess the adequacy of proposed concepts of employment and the supporting organization required for STOM.

Fires and Maneuver. The Lab continues to explore technology solutions to address improvements in fire support to improve precision, terminal effects, responsiveness, and mobility. The focus of effort has been to address these areas with respect to Expeditionary Maneuver Warfare (EMW) and specifically STOM well as the subset of Military Operations in Urban Terrain (MOUT).

Technological experimentation initially centered on precision targeting systems. Laser range finding systems for the Forward Observer/ Forward Air Controller have been examined along with UAV-borne systems. Results are promising but improvements are required. Other areas of effort include developments in reduced complexity, fires adjudication/ allocation, laser designation systems, and compatible communications.

All systems must be internally transportable in the MV-22 for STOM operations.

Wargames have highlighted the need for a future combat vehicle to enhance maneuver. Advanced Mobility Vehicles are being explored for use during seabased operations. The MAGTF Expeditionary Family of Fighting Vehicles Program (MEEFV) is looking at vehicles for the mobile combined arms MAGTF. Other opportunities for using technology to enhance maneuver are; integration of autonomous systems, enhanced mine detection and neutralization, and predictive diagnostics to reduce logistic requirements ashore.

Logistics. The Lab will examine seabased logistics capabilities needed to sustain a STOM force. Efforts will focus on Marine Air Ground Task Force (MAGTF) Logistics Command and Control. In addition to examining technologies and procedures for digital supply support requests, the Lab will also explore capabilities required by the Combat Service Support Element to maintain situation awareness of ground combat element operations and deploy mobile combat service support detachments on a non-linear battlespace. Software is being developed that provides the MAGTF with automated logistics planning and execution tools that will compliment and be interoperable with current and emerging MAGTF, Naval, and Joint C2 processes and systems. The Lab is also working on computer tools to permit near real time course of action analysis and computer assisted tracking of changes in logistics databases. These tools are the next step in providing the decision support systems to integrate operations and logistics and enhance decision-making.

Another key effort is the Joint High Speed Vessel (HSV). Focus is on Amphibious

Task Force interoperability, intra-theater delivery of selected equipment, and the role of the HSV as a critical piece of the seabase. Other logistics related Lab projects include improving health services, supplemental fuel carrying systems, lightweight water purification systems, mine counter measure systems and utility tractors.

Emerging Threats and Opportunities.

The Lab will continue to conduct concept exploration and assessment of new threats and opportunities through its Wargaming Division and the Center for Emerging Threats and Opportunities (CETO). CETO serves as a catalyst to stimulate thought and to debate issues of importance to the Marine Corps. Current areas of interest include but are not limited to base security assessments, forcible entry study, cultural intelligence seminars, and regional area studies. The Lab will seek to identify means to better support the Marine Corps operating forces and Expeditionary Force Development in order to shape Marine Corps capabilities in the face of terrorism, increased focus on Homeland security, and changes in the overall international security environment.

Wargaming. The Marine Corps Wargaming Program is a comprehensive and innovative effort focused on advanced policy, concept, and operational exploration at several levels: Title X Wargaming, Joint and external gaming efforts, and a broad and diverse array of Service programs.

Title X Wargaming efforts will be considerable and will consist of two broad components. The first is the management, oversight, and assessment of Marine Corps participation in other Service-sponsored Title X War Games. The second is the execution and assessment of the Marine Corps' Title X Wargaming Program, *Expeditionary Warrior*. Expeditionary

Warrior will be a series of smaller, more focused games and related events that can either be connected by a common theme or address discrete issues of particular concern to leaders.

Joint and external wargames are broader and a less well-defined aspect of the USMC wargaming effort. Examples include the Office of the Secretary of Defense (OSD) Net Assessment's Revolution in Military Affairs and Transformation War Game Series. Also included are relevant gaming efforts of other Services not encompassed by Title X programs.

Marine Corps wargaming programs embrace an extensive array of activities that are planned and executed. These may include Joint, interagency, and even non-governmental participation. Marine Corps war games have been developed for various themes including but not limited to experimentation, combating terrorism, expeditionary/Naval, dynamic decision-making, urban warfare, homeland defense, and exploratory/future gaming. These war games are used to assess a broad range of "war" related issues for leadership use.

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SEA VIKING 2004

Sea Viking 04 describes a series of related events that constitute near term Marine Corps Service experimentation. SV 04 is also the first step in an experimentation program designed to transform the 1997 *Ship-to-Objective Maneuver (STOM)* concept into an operational reality.

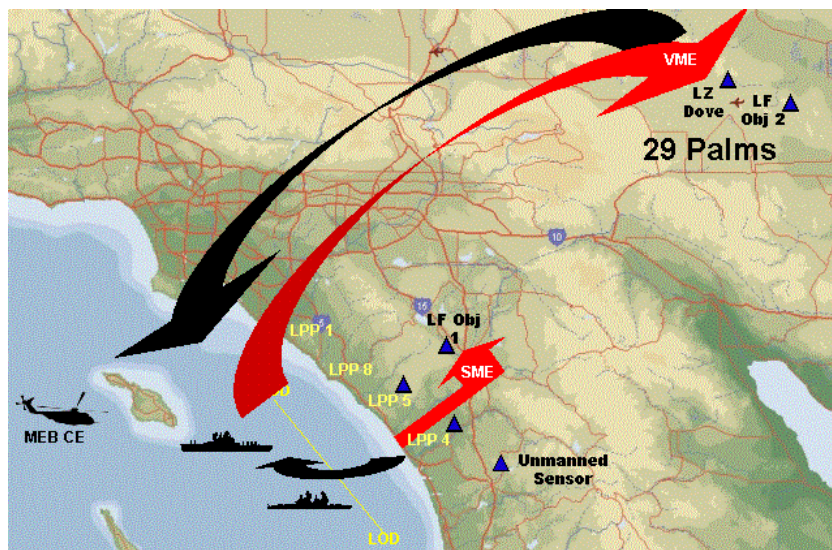
Description: Preliminary events consist of limited technical assessments, workshops, wargames, and modeling and simulation “CPXs.” SV 04 will culminate in a live force experiment conducted the Fall 2004 by West Coast Navy and Marine Corps operating forces.

Hypothesis: “If program of record command and control systems are augmented by experimental capabilities (Doctrine, Organization, Training, and Equipment)... then STOM operations as envisioned in the concept will begin transition to operational capability.”

Organizations Involved: SV 04 seeks to unify the efforts of the Marine Corps Combat Development Command and the operating forces. In addition to STOM capability transition SV04 also seeks to eliminate the “digital divide” currently experienced by Corps tactical units. I MEF and 3d Fleet will provide the bulk of the operating force participation in preliminary events and the live experiment.

Focus: The focus of SV 04 is on the move/over the horizon” command and control (OTM/OTH C2), with particular attention to the MAGTF’s Command, Ground Combat, and Combat Service Support Elements. Within OTM/OTH C2, the experiment will examine OTM/OTH

communications, common tactical picture (CTP), collaborative planning, and reconnaissance, surveillance, and target acquisition (RSTA) in a STOM context.



Deliverables: SV 04 has near and long term goals. The near term perspective is focused on enhancing the capabilities of a deploying ARG/MEU. The experimentation program, in its entirety, will examine programs of record (POR) and experimental technologies developed with an eye toward achieving a significantly more capable force. It will also assess the capability of these POR systems to support the STOM concept. If the experiment achieves the desired results, a MEU will take the enhanced command and control system “to sea,” for further refinement, having been the beneficiary of a dedicated and integrated training package, with requisite tactics, techniques, and procedures and standing operating procedures. This serves as an introduction to the long term goal, which focuses on the full implementation of the approved STOM and emerging Expeditionary Strike Group concepts, as well as the architectures and command arrangements these will mandate. A principal focal point of this effort will be the draft MCWP 3-31 (STOM) doctrinal publication.

COMMAND AND CONTROL & INFORMATION TECHNOLOGIES (C2IT)

The Problem

Current and projected Command and Control (C2) systems do not support the future vision, as expressed in *Beyond C2*, nor the seabased C2 requirements of *Expeditionary Maneuver Warfare (EMW)* and *Ship-to-Objective Maneuver (STOM)*.

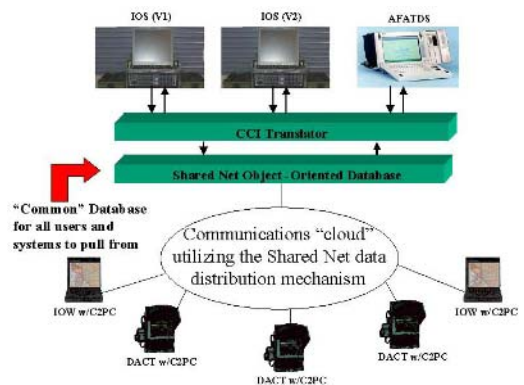
Missing are a number of specific C2/IT capabilities such as the following:

- Wide-band, over-the-horizon (OTH), communications architecture.
- Integrated expeditionary C2 system that is capable of supporting a distributed Common Tactical Picture (CTP) across the entire Marine Air Ground Task Force (MAGTF) afloat and ashore.
- On the Move ground combat element Combat Operations Centers (COC) in support of STOM operations.
- Decision support systems available at all levels to specifically include the infantry battalion.
-
- Lightweight, durable, secure tactical communications within the infantry platoon.

Exploring the means to remedy these shortfalls is the goal of the Lab's C2/IT focus effort. At the tactical level, the effort is from the bottom up. At the operational level, the focus is at providing the capabilities for the Marine Corps operating forces to function more effectively in the context of evolving joint operational concepts.

Command and Control Integration (CCI)

The MCWL CCI effort was born out of the Integrated Marine Multi Agent Command and Control (IMMACCS) program, which was based on the work initiated by MCWL and the California Polytechnic State University (Cal Poly) in leading edge, object oriented, intelligent agent C2 software. Combined with the Jet Propulsion Lab's Shared Net, and Space and Naval Warfare Systems Center, San Diego's CCI Translator (CCIT), the CCI system architecture provides the tactical level model for command and control on the battlespace.



The Lab's Experimental COC design, with the integration of the IMMACCS system, has provided a prototypical operational and tactical level test bed to explore leading-edge technology for future experimentation. With the integration of these efforts and with the acquisition programs of record, the Lab is able to leverage the technology and the experience of operational forces to ensure that the system supports the defined requirement.

The Lab continues its initiative begun in April 2000 to transition CCI to the Marine Corps Systems Command (MARCORSYSCOM) in order to support the integration, data distribution, and data

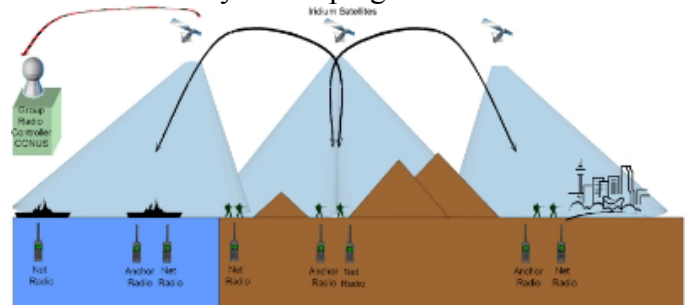
consistency of the separate MAGTF C4I Software Baseline (MSBL) components. The focus of experimentation during 2002 was to model the legacy data network traffic and scale the CCI system in order to use existing tactical radio assets for data distribution. This included the currently fielded versions of the Single Channel Ground and Airborne Radio System (SINCGARS) and the Enhanced Position Reporting Location System (EPLRS) radios. For 2003, the focus of development is to provide a common database (Shared Net) with a bi-directional translator (CCIT) to existing tactical data systems at the regiment level in order to provide interoperability between those systems and to improve the accuracy and timeliness of the information that populates the Common Tactical Picture (CTP). The desired end state is to develop a capability to synchronize data across legacy systems and perform data distribution down to the platoon level. Targeted time frame for completion of capability and transition to MARCORSYSCOM is September 2003.

As the Warfighting Lab's RSTA projects are being developed, MCWL is working to integrate the messaging and position location information from remote sensor platforms into CCI to improve information for the tactical commander.

In addition, the Lab will continue to explore the use of intelligent agents in various decision support tools to include the ONR funded **Seaways/Loggy** adaptive planning tools that permit near real time collaborative, adaptive planning and production of statements of logistic requirements, offload plans, and logistic support plans for multiple courses of action.

Over-the-Horizon (OTH) Communications

A Lab generated Universal Needs Statement (UNS) for an OTH battalion and below communications capability has been accepted into the Marine Corps Combat Development Command's (MCCDC) Expeditionary Force Development System. The Lab evaluated potential solutions for experimental use during Sea Viking 2004 and is currently developing the



Expeditionary Tactical Communications System (ETCS), which will provide IRIDIUM, netted (one to many) voice and data communications, vice the technology's current point-to-point capability. ETCS will provide 50 Global Net Radios linked to current Marine Corps systems such as the Intelligence Operations Server (IOS) and the Intelligence Operations Workstation (IOW) aboard ship, IOWs at the battalion COC, and the Data Automated Communications Terminal (DACT) at the company level.

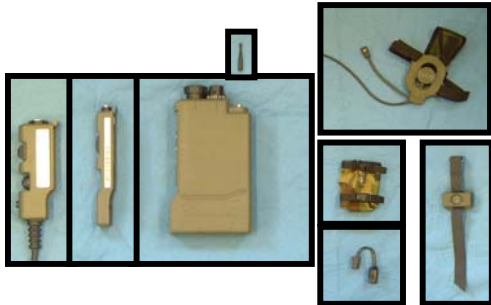
The objective end state is to provide a deploying MEU with an experimental capability and produce DOTMLPF recommendations for the OTH communications requirement.

Infantry Company Communications

The Lab has assessed the tactical communications requirement within the infantry rifle company through numerous

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Project Metropolis experiments. As a result of this experimentation, the Lab has determined the communications capabilities necessary to support emerging tactics, techniques, and procedures. Specifically, the Lab has explored candidates for a secure platoon tactical radio and a Limited Probability of Intercept/Limited Probability of Detection (LPI/LPD) intra squad radio.

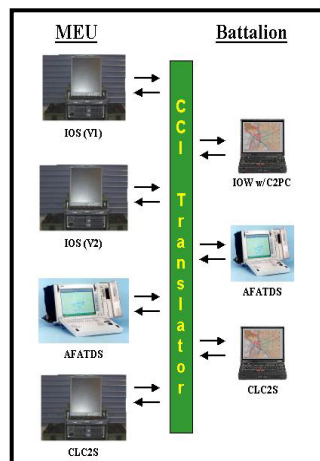


The desired end state is a clear determination of the following:

- What is the best off-the-shelf solution?
- What logistical considerations, such as battery usage/recharging, must be taken into account?
- What are the manning implications? Are more communications specialists required in the infantry battalion?

Digital Combat Operations Center (DCOC)

Current and future operations require that COCs operate on the move using both voice and data while synchronizing maneuver, intelligence, logistics, and fires to create a common tactical picture (CTP). The Lab, in conjunction with



other agencies, is exploring the integration of various digital systems to provide commanders with the capability to operate in an OTH environment while on the move. Current efforts focus on the use of the Lab's Expeditionary Tactical Communications System (ETCS), CCI, and on the move (OTM) capable combat operations centers (COC). Potential OTM COC platforms include a sheltered HMMWV and multiple wireless HMMWVs. The Lab is also examining OTM C2 systems for use by battalion and company commanders during helicopter operations.

Improved Airborne Command and Control Capability (IAC3)

ONR and the Warfighting Lab funded an effort in FY01 to integrate the Army Airborne Command and Control System (A2C2S) into a UH-1 airframe, as a potential replacement for/enhancement to the ASC-26 specialized communications package. The Naval Research Lab was tasked to



construct and provide this improved capability for participation in Kernal Blitz Experimental (KB (X)) 2001. The results of the initial LTA, conducted in the Spring of 2001, determined that the technology was immature and not ready for participation in KB (X). After a fourth LTA, conducted in Nov 2002, the IAC3 was only capable of supporting future Lab experimentation but was deemed not ready to support operational forces.

The Lab and ONR are currently researching alternative solutions using legacy multiband radios. This initiative supports the Marine

Airborne Command and Control Console UNS (Draft) and the Universal Communications Interface Module (UCIM) program of record.

Voice over Internet Protocol

Voice over Internet Protocol or (VoIP) as it is more commonly referred to, provides a method of transporting voice communications over existing data networks. This ability to “converge” our communications networks may allow the deployment of only one communication network where we currently deploy several.

Deploying a “converged” communications infrastructure will allow the Lab to evaluate the benefits of providing cutting edge technologies to field units over existing tactical networks.

Improving the quality of communication, both in voice and data format, streamlining the

asset requirement to provide those communication paths, and allowing for remote management and control of the network are the areas this effort intends to address.

Testing of VoIP will include configuration and setup, deployment, standardization, measurable Service Level Agreements (SLA's) and evaluation over a variety of data paths.

PRE First In Command and Control System (PRE-FICCS)

The Preliminary First In Command and Control System (Pre-FICCS) is an ONR sponsored system being tested by the Lab.

It provides an air or ground transportable, small footprint, suite of communications and C2 applications appropriate for a forward MAGTF COC. By using the latest in technology and protocols, such as ATM, the Pre-FICCS is quickly able to communicate and collaborate with joint units and reach back to Defense Information System Network (DISN) Teleport locations. At the same time it is able to communicate ‘downward’ by its ability to integrate such fielded equipment as EPLRS and SINCGARS. The current integrated package uses only components available today, meaning that Pre-FICCS could be employed immediately in support of operational units. However, follow-on technology may quickly be inserted as it becomes available. Being currently developed by Naval Air Warfare Center Aircraft Division (NAWC-AD) with ONR funding, the Pre-FICCS attempts to satisfy an UNS initially sponsored by Marine Force Pacific (MARFORPAC). Based on MARFORPAC's recommendation, Pre-FICCS was incorporated into the live forces portion of MC02. After MC02, Pre-FICCS



was moved to the MCTSSA for maintenance and any further use. In November 2002, IMEF requested the use of Pre-FICCS in support of Operation Enduring Freedom (OEF) and the systems underwent modification and was subsequently sent to Camp Commando in Kuwait.

Background

One of a number of challenging operations will be the *Ship-to-Objective Maneuver* (STOM), as described in the 1997 warfighting concept, that requires greatly increased air and ground mobility, seamless over-the-horizon



imperatives of tactical operations will change as events unfold. Unit commanders maneuvering at sea -- often in darkness, toward selected Littoral Penetration Points (LPP) on a hostile shore -- will not be *controlled* in the conventional sense. Their actions, however, are *coordinated* to prevent the unforeseen actions of one unit creating a disadvantage for another.

The MAGTF's RSTA system and related command and control (C2) architectures must provide timely and relevant information during this crucial phase of a STOM. However, the additional speed, maneuverability, and range of STOM operations add potential risk. As forces are more dispersed, a networked tactical RSTA grid is essential to prevent surprise and to provide mutual support. An effective RSTA system under the control of the Marine commander at the tactical level is a key risk mitigation enhancement. National-level, theater, and Joint products will not and cannot fully satisfy tactical information requirements.

The organic tactical RSTA system is the primary means that Marine commanders at all levels have to collect tactically relevant information to amplify information available from the external assets. The tactical RSTA system is a grid fed from the bottom up; therefore, the tactical units at the company level are the foundation of any RSTA system. Accordingly, a stand alone capability must exist within the infantry battalion that is capable of coordinating the employment of organic RSTA assets to support the commander's information needs in the areas of (1) situational awareness and force protection, (2) indications and warning (I&W), (3) planning and execution, and (4) battle damage assessment.

RSTA Components. The RSTA system contains two crucial components, the **RSTA Grid** and the **Common Tactical Picture**.

The RSTA Grid. The *RSTA Grid* is a network of forces and sensors within the area of operations. This network, composed of mechanical and human sensors -- individual Marines and Marine operating units -- provides reconnaissance, surveillance, and target acquisition for a prescribed area. **A seamless information-sharing network must link grid components.** Since RSTA assets are information gathering resources, the planning for and establishment of the RSTA Grid must be linked to the commander's information requirements and targeting priorities. Using the requirements and priorities as inputs, the Intelligence Preparation of the Battlespace (IPB) process will guide the intelligence collection plan. The intelligence collection plan functions as the major factor in determining how to employ and allocate



RSTA assets to create the grid. The grid is an integrated collection of RSTA assets positioned at various locations within the battlespace designed to meet commanders' information requirements. The grid must be rapidly moveable, flexible and adaptable in order to respond to the dynamic requirements of the battlespace.

Common Tactical Picture. The CTP is the most current depiction of a prescribed battlespace in a comprehensible visual display of all known or suspected units, to include

friendly, enemy, and pending tracks. The CTP is derived from the common tactical database (CTD) and other sources and refers to the depiction of the battlespace for a single operation within a commander's area of operations. The CTP includes current, anticipated or projected, and planned



dispositions of hostile, neutral, and friendly forces. The CTP includes force location and real time and non-real time sensor information. This visual

display of the battlespace is derived from the combination of intelligence data from higher echelons -- specifically the Joint Intelligence, Surveillance and Reconnaissance (JISR) -- and the tactical RSTA grids. The RSTA grid, comprised of mechanical and human sensors, provides real and near real time information to the CTP that enables commanders to make timely decisions. This battlefield picture creates battlespace awareness and provides a common understanding of the battlespace among MAGTF units and commanders. The processed data and information is automatically portrayed in such a manner as to permit pattern recognition and implicit understanding among commanders at all echelons in order to facilitate effective decision-making and decentralized execution.

Tactical RSTA System Developmental Priorities. The measure of effectiveness of any RSTA system is its ability to meet the battlespace information needs of tactical commanders and decision makers. The challenge inherent in expeditionary maneuver warfare is to provide timely, relevant information to rapidly maneuvering forces throughout the range of naval expeditionary operations. Developmental efforts must focus

on devising and improving Marine Corps RSTA capability in the following areas:

- Battlespace/situational awareness via a networked array of sensors.
- Flexibility and survivability of sensors.
- Rapid planning and decision making through information processing and display of various forms of information.
- Supporting multiple, high tempo operations consistent with maneuver warfare.
- Timely and accurate target acquisition and BDA.
- Force protection.
- Automated links from the RSTA Grid to CTD/CTP.

Therefore, experimentation will be designed to support these developmental efforts by focusing on the following related characteristics necessary for an effective RSTA system:

Connectivity

The RSTA system must be able to transmit accurate and timely information to those who must receive it, when they need it. Connectivity depends on active management of the information flow. Tailoring information to the needs of the commander prevents critical intelligence from being delayed or lost in irrelevant data. Information on vital enemy targets acquired by RSTA assets becomes useless unless disseminated in a timely fashion to the forces tasked to attack and destroy the targets. Interoperability, commonality, and connectivity improve and unify RSTA capabilities and enhance planning and execution.

The ability to operate with the other services and likely coalition partners is a fundamental

design criteria for a RSTA system. Properly engineered, the RSTA system will be useful for a broad range of naval, joint and coalition missions. Interoperability and commonality also improve the overall capability of RSTA through cross cuing¹, information enhancement, and analytical exchange to accurately portray the battlefield. The multidiscipline, multisource approach reduces the risk of deception by the enemy.

Responsiveness

RSTA assets must be sufficiently responsive to meet the needs of the commander at any point along the operational continuum and in any scenario. Commanders at all levels should have RSTA assets available to provide information when and where needed. The responsiveness of the RSTA assets available to any commander must be looked at in aggregate and be driven by the missions that must be accomplished. The commander must examine the range of required missions and ensure that appropriate and sufficient RSTA assets are employed and positioned to meet C2 needs.

Survivability

Survivability must be commensurate with the threats to which the RSTA assets will be exposed during the course of operations. These assets must be as survivable as the operational systems and forces they support. Survivability must be assessed for the entire RSTA system—collection platforms, sensors, communications and data links, ground stations, processing facilities, personnel and operators, etc. Not all systems, or nodes within a system, need to have the same degree of survivability. Nevertheless, technology can enhance survivability of many unmanned,

¹ Cross cuing is the capability of the RSTA grid to use the triggering of one sensor to activate other sensors to classify an event or signal of interest.

remote sensors. Miniaturization will complicate enemy counter-collection efforts, and larger numbers of distributed small, inexpensive sensors provide redundancy and flexibility in the event of losses. In addition, low probability of intercept; low probability of detection (LPI/LPD) communications will both enhance survivability and security. Many RSTA assets will be vulnerable and relatively scarce. Commanders must prioritize the use of RSTA assets and consider how they would compensate for the loss of a RSTA capability should any specific asset or group of assets be destroyed or become unavailable. Besides careful planning, intelligent tasking, and effective employment tactics, redundancy and overlap of capability are perhaps the best ways of ensuring the survivability of specific RSTA capabilities and functions.

Adaptability

In addition to providing the commander the information he needs to facilitate the decision-making process, the RSTA system must be adaptable enough to be deployed on and employed from various platforms, in a variety of environments, range of distances and types of climates. Furthermore the RSTA system must be able to expand or contract along with the size of the operational area of the forces that employ it.

Mobility

Expeditionary Maneuver Warfare exploits the inherent mobility of naval forces and the use of the sea as a maneuver space. Surface and vertical maneuver elements will operate across greater distances with greater speed than ever before. RSTA assets must support these units as they seamlessly transition from maneuvering at sea to maneuvering ashore. Maneuverability fosters flexibility, which in turn permits commanders to adapt the RSTA system during execution in order to respond to

changing perceived threats or opportunities. Components of the RSTA system should be retaskable and mobile enough to adjust to new missions, or to adapt to new monitoring positions. They should enable rapid and continuous maneuver and high tempo operations consistent with maneuver warfare, regardless of terrain or operational environment, to include urban operations.

Accuracy and Utility

Information provided by the RSTA system must be accurate and usable in the short time frames associated with EMW. As the use of precision weapons becomes standardized in military operations, knowing exact location, often to the foot, or even inch, is imperative for the targeting process. Reconnaissance and surveillance may not require pinpoint accuracy, but target acquisition requires a sensor grid that ultimately produces a target location or aim point suitable for attacking systems. The entire RSTA system must be worth the expense in manpower demands, logistical burden, maintenance and training costs to justify existence at each level of command supported.

RSTA 2003-2004 Experimentation

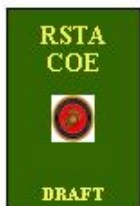
During 2003-2004, Sea Viking experimentation campaign the Lab will assess the adequacy of proposed concept of employment and supporting organization for legacy, Program of Record (POR) and experimental sensors in support of STOM. The following products from these events will provide both near-term enhancements for operating forces, prototype capabilities for further experimentation by a deploying MEU, and those that can be further developed through MCCDC/MCWL experimentation:

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Doctrine.

- Future MEU and Battalion COE, with supporting organizational structure, TTPs, and CTP procedures.
- Dragon Warrior, Unmanned Ground Sensors (UGS), Marine Recon COE and TTPs.



systems, tactical day/night digital video/still camera systems, remote observation and confirming sensors, ruggedized handheld computers, stabilized binoculars, Global Positioning System (GPS) watches and other new technology advances that enable the Marine to collect information more accurately, increase stand-off ranges, move lighter, and report faster. Ultimately, recon teams will have the capability to employ a RSTA vehicle that is internally loaded on a MV-22.

Organization.

- Changes to T/O associated with fielding of Dragon Warrior and UGS.

Training.

- Supporting Programs of Instruction for Dragon Warrior (DW), Reconnaissance TTPs and MEU/Battalion RSTA COE.

Project RSTA is continuing efforts to enhance tactical reconnaissance through improvement in tactics, techniques, procedures and supporting technologies. Efforts are focused across the spectrum of environments that Marines can be called upon to operate in but with a special emphasis on urban terrain. Currently we are evaluating systems, which enable reconnaissance teams to gain militarily significant information from extended distances as well as sensors and other enabling technologies.

Material.

- The Unattended Ground Sensors (UGS) will be integrated into the Lab's Expeditionary Tactical Communications System (ETCS) to transmit sensor reports to a sea-based COC via an Iridium netted Over-the-Horizon (OTH) communications system.
- Marine Reconnaissance Technologies with a goal of enhancing Marine Reconnaissance capabilities by reducing the weight of the combat load carried by Marine Recon / Scout Sniper Teams, and to enhance their capabilities to collect and disseminate gathered information to the proper level. Commercial-off-the-shelf (COTS) / Government-off-the-shelf (GOTS) equipment will be examined to include: wireless day/night camera

Fires and Maneuver Supporting Focus Area

Philosophy

The Lab is focused on exploring capabilities that will permit the seabased Marine expeditionary forces to conduct future maneuver warfare operations fully employing the precision fires, highly mobile indirect fire systems, and vehicles that will be internally transportable in future helicopters and tilt-rotor aircraft.

Fires and maneuver technology development is primarily focused on (1) precision target location for delivery of accurate fires, (2) development of a viable mobile fire support system for the support of the air delivered ground combat force during Ship-to-Objective-Maneuver (STOM), (3) the development of internally transportable ground combat vehicles within helicopters and MV-22, and (4) the development of effective mine counter measures for the maneuver forces.

Background

The Lab has been investigating and experimenting with technology solutions to address improvements to fire support to, among other things, improve precision, terminal effects, responsiveness, and mobility. A focus of effort has been to address the unique requirements of fire support in respect to *Expeditionary Maneuver Warfare (EMW)* and specifically (STOM) as well as the subset of *Military Operations In Urban Terrain (MOUT)*. EMW/STOM operations have several unique challenges, beyond those posed by conventional operations, because of the distances traveled by the littoral

penetration force and the initial isolation of those first elements.

As first demonstrated in the *Hunter Warrior* Advanced Warfighting Experiment (AWE) in 1997, the key fire support for a EMW/STOM force must be sited with that STOM force to ensure responsiveness in all situations. Long times of flight and/or processing reduced the effectiveness of fire and all but eliminated the attack of fleeting and mobile enemy targets. High volume of fire requirements, such as preparation fires, final protective fires, etc., could not be addressed using sea-based fires beyond the basic 30 km maximum range of conventional 5-inch caliber naval surface fires.

Any system accompanying the STOM force must be sized to fit within the envelope of the MV-22 Osprey or helicopters and the logistic support, that is the ammunition for those weapons, must represent the optimum effects available per shot for the most efficient volumetric and weight package per sling load/cargo bay/truck bed. During this same AWE, the marked improvement in precision targeting devices proved to be a decisive factor in the prompt engagement of mobile enemy targets. Even though these first-generation systems were bulky and complex, significant gains in target identification, acquisition, and fire mission transmission speed materially improved the combat effectiveness of the STOM elements.

During *Urban Warrior*, the focus was on combat in the urban environment and very precise targeting, fast response times, and tailored effects of those fires moved to the forefront. The targeting required precision in the vicinity of a few meters with an exact target altitude to ensure that weapons engaged the exact room being targeted and would not kill friendly forces or noncombatants in close proximity. Tailored effects were modeled to

focus the lethal or less than lethal effects on the target and not cause damage that would threaten or impede the MAGTF mission. Fires coordination experimentation only began to touch on the complexity of allocating, adjudicating, and deconflicting fires and flight paths in the compressed three-dimensional space above and within the city.

Urban Warrior demonstrated that once again, combat within a city is exceptionally close-coupled, vertical as well as planar, and extremely dangerous. New directions in technology will be required to offset an enemy's advantages and reduce the MAGTF's casualties by using supporting arms within the walls of the "urban canyon".

Based on experimentation results and the lessons learned from Limited Technical Assessments (LTAs), it is clear that the continued evolution of fire support to support EMW/STOM and urban operations, as well as more convention combat scenarios, entails continued technological development and experimentation in the following directions:

Responsiveness. All forms of fire support need to be delivered as quickly as possible to ensure the destruction of key enemy strengths and offsetting the relative vulnerability of the lead elements of an EMW/STOM force. The more quickly a target is struck, the more likely the threat will be neutralized and the more effectively that threat is removed from the path of the EMW/STOM force. In the case of mobile targets, fast response times are essential: enemy forces can quickly overwhelm or escape the MAGTF if they cannot be attacked quickly.

Precision. Striking an enemy target with the first round fired is an achievable ideal and an essential requirement for a force with limited logistic access. This precision requires accurate target location by ground observers,

Unmanned Aerial Vehicles (UAVs), and other elements of the Reconnaissance, Surveillance, Target Acquisition (RSTA) Grid, then state-of-the-art technical fire direction flight path prediction that incorporates real-time meteorological data, velocity variances, experience-based data and other techniques to dependably place projectiles close enough to neutralize or destroy a target on the first shot. In addition to improving the effectiveness of fires against the targets engaged, this will also allow greater depth of engagement against detected enemy forces, extending the *reach* of EMW/STOM elements while reducing the logistic loads required to effectively support our forces in long distance operations.

Flexibility. Supporting the EMW/STOM maneuver forces requires systems and weapons effects that can accommodate the wide range of terrain, weather and tactics that will be encountered. The initial entry forces of the STOM force will be constrained to work within the envelope of the interior of the MV-22 Osprey or helicopters which is to say, they must be very compact and light.

Fire support systems that are designed to conform to these specifications must be able to be upgraded with the addition of modules to adopt new characteristics and capabilities as the EMW/STOM force transitions to a mobile maneuver force. The effects delivered must be able to confront all types of target in any feasible environment, such as reduced effects when supporting an urban attack, or the ability to defeat field fortifications or light armor or penetrate heavy vegetation cover in addition to the conventional *infantry in the open* type of targets.

Mobility. Ground combat forces transported by air must have internally transportable fire support systems and selected vehicles for ground transportation. External lifts, while adequate for short distance movements,

cannot be used for long distance STOM operations. Aircraft that are carrying an external load are constrained by slow speed, excessive fuel use, and vulnerability. Over 100 nautical miles, the penalties posed by external loads make it impossible to carry any meaningful load in that manner. Once the force is on the ground, fire support systems must be able to move at the same speed and over the same terrain as the maneuver force. Once the STOM force has transitioned to a conventional mobile force, then the fire support systems must be able to transition to the same mobility.

Logistic Supportability. Ground fire support is a function of delivery means positioning, range, rate of fire, and ammunition flow. Ammunition flow depends on the means available for movement ashore, surface transportation and roads available, airlift assets and approach lanes available and in the case of larger caliber weapons, the availability of materiel handling equipment at the firing positions. Like the flow of fuel to an engine, ammunition movement determines the tempo of the weapon rates of fire and the amount of fire support effects available for influencing the direction of the battle.

These and other areas were shown to be deficient in the context of these warfighting experiments and these deficiencies and the work of the Operational Maneuver From the Sea (OMFTS) Working Group have helped guide the Lab to pursue directions to address these deficiencies.

TECHNOLOGICAL DEVELOPMENTS

Precision Targeting. The first technological direction has been to continue to develop the technologies for precision targeting systems. Observers have been hampered by equipment that has been either primitive or heavy, complex, troublesome and often inaccurate.

The first prototype precision targeting systems also had difficulty communicating the fire missions through legacy fire support coordination systems and the potential gains in responsiveness were lost through these interruptions.

The Lab has experimented with several competing eye-safe laser range finding systems that were incorporated into the Forward Observer/Forward Air Controller (FO/FAC) system to allow direct transmission of fire missions to fire direction/fire support coordination systems. The Lab has also experimented with UAV-borne precision targeting systems using the *Dragon Drone* UAV as a platform, as well as the Airborne Target Acquisition (ATA) system developed by the Naval Surface Warfare Center at Dahlgren. These experiments demonstrated that precision-targeting devices could lead to a leap-ahead capability for the attack of enemy targets and greatly facilitates accurate employment of supporting arms. The main technological/engineering impediments to fielding next generation precision targeting systems are:

Weight. Several of the available targeting systems weigh between 30 and 45 pounds, less radios, and limit the mobility of ground observers.

Complexity. Several precision targeting systems require multiple connection cables, batteries, and modules to function. Additionally, many of the prototype systems have complex programs that require completing successive data entries to complete the preparation of a fire mission.

These complex systems require time to process a fire mission and a high level of training for observers to employ them. One observed effect has been the tendency of the developers of precision targeting software to

make the observer provide the maximum amount of data – such as the detailed description of targets – to facilitate the decision-making software at the fire support coordination centers. This has had the effect of increasing observer data entry requirements and reducing fire mission responsiveness.

Location Errors. Most or all of the available precision targeting devices use a magnetic compass for target direction. These compasses introduce an error of 15 mils or more, even if the compass is properly declinated for its surroundings. This error can equate to at least 75 meters at 5,000 meters. The use of newly designed miniature gyros can provide much greater directional accuracy and reduce these errors.

Communication. Systems developed to work with some fire support coordination software systems will not work with others. The message address formats in present use are being supplanted at some future date by a new joint format system, which is not yet available. This has had the effect of constraining the development of any new systems until the new formats are defined.

Fires Adjudication/Fires Allocation. This arena of fire support coordination has been the most difficult technological challenge of the sensor-to-shooter chain for EMW/STOM. These types of systems facilitate target attack to support the commander's intent for the scheme of maneuver and to choose and allocate fires based on the basic priority system. None of the systems used – legacy or new technology – can adequately merge air fires and naval surface fires and ground fires. During experiments, multiple systems have been required to coordinate the different elements of fire support.

Experiments have also demonstrated the reduced *footprint* of employing this or similar

systems, since there is no requirement for additional communications, fire direction, or survey teams required to support firing operations.

Another series of experiments with air-delivered fires in urban operations, the Aviation LTA at Yuma, Arizona, demonstrated the effectiveness and state of development of precision air-delivered fires in a MOUT environment and laid out the directions for further development and experimentation. The main areas of further development were:

Precision targeting. As with ground-based fires, precise location of targets in three dimensions is critical to the effective employment of air-delivered fires in MOUT.

Laser Designation Systems. This capability is key to precision attack with laser-guided weapon systems and the lasers were shown to be ineffective during the employment of obscuration.

Scalable-Yield Weapons. Air-delivered weapons are the most powerful supporting arms available in our inventories. In many cases during urban combat, the larger of these weapons would be constrained from use because of the danger to friendly forces and noncombatants in close proximity and the excessive rubble it created. A scalable yield system to give weapons that were usable in close combat within a city was shown to be needed.

PRECISION TARGETING

The Advanced Target Handoff System (ATHS (X)) combines the Litton MELIOS laser rangefinder with the combined arms targeting software in the Ruggedized Handheld Computer (RHC) and a small tactical radio to provide a lightweight and

accurate targeting system for air, naval, artillery fires. This system is designed for minimum steps to prepare a fire mission, using defaults to simplify and speed the handoff of a target to a fire support agency for attack. This system allows an observer to accurately target out to 10,000M and process air, naval, and ground fire missions interchangeably and simultaneously.



Exploiting the color map projection, aircraft tracking, internal Global Positioning System (GPS) card, communication with AHS-8B aircraft, and full nine-line generation capability of the AHS (X), an observer can simultaneously control a close air support mission while firing artillery, mortars or naval surface fires against targets.

Upgraded UAV Targeting System.

Continuing with the development work initiated with the Dragon Drone targeting system and the ATA system, a new generation UAV targeting system, which allows target acquisition using a Synthetic Aperture Radar (SAR), is being proposed. The SAR system prototype was tested in an LTA taking place at Yuma AZ during summer 2001. At the same time, a new system to relay targets from the UAV to other systems is being tested in an LTA. This capability would allow the *Dragon Warrior* UAV and others to relay targets to aircraft, fires coordination centers or the weapon itself. To upgrade the precision of the UAV targeting system, a geolocation system is being examined that would allow the UAV targeting system to calibrate its

targeting system by aiming at known geographic points.

The Expeditionary Fire Support System (EFSS)

One of the more controversial concepts explored during the Hunter Warrior AWE was the employment of helicopter internally transportable 120mm mortar systems that once on the ground could be operated remotely and autonomously by infantry squads using a modified electronic "PIN" system.

Subsequently, the Marine Corps developed a more refined concept called the EFSS to provide a highly mobile indirect fire support system that could be internally helicopter and MV-22 transported and provide a fire support system once off-loaded with the same mobility as that of the force it supports. The Marine Corps is currently exploring alternative systems to meet the EFSS requirement with an objective of initial operational capability during FY06.

The Lab has conducted a series of experiments with a 120mm rifles, automated mortar system known as the *Dragon Fire* which has demonstrated many of the capabilities called for in the EFSS Mission Need Statement (MNS) and can form the basis for the new EFSS.

In the *Dragon Fire* the functions of communication, power movement of the firing elements and loading systems and automated fire control, and precise positioning and pointing systems were combined to reduce response time and increase accuracy in a medium-caliber, medium-range system. In addition, this system is internally transportable within MV-22 Osprey aircraft.



The Expeditionary Fires Technology Demonstrator, Version 2 (EFTD V2). In cooperation with the Office of Naval Research, Future Naval Capabilities the lab is working to develop the next-generation version of the *Dragon Fire*. This new system will have all of the capabilities of the *Dragon Fire* – automated fire control and aiming, 6400-mil capability, sensor-to-shooter connectivity – but will incorporate the “lessons learned” from experimentation to be a better system. The EFTD V2 will be around 3,000 pounds instead of the 6,500 pounds of the present system, and it will be able to fire for longer periods on its internal batteries through more efficient technologies.

Modular Firing System. The EFTD V2 will also have the capability of uploading onto a modified Light Armored Vehicle (LAV) to become a self-propelled fire support system. This will enable the EFTD V2 to support both the Vertical Assault Element of the Expeditionary Maneuver Forces as a

helicopter-mobile system as well as light armored maneuver forces.

In Stride Fire Support. In parallel with the development of an LAV modular capability of the EFTD V2, the aiming system of the weapon will be used to stabilize the tube while the vehicle is moving. This “fire on the move” capability will give the MAGTF the capability to attack targets without having to stop and interrupt the momentum of a maneuver force.



The high water speed and firepower of the Advanced Amphibious Assault Vehicle will support expeditionary force by providing an amphibious *break through* or assault force, creating the necessary penetration points along the littoral defenses.

The near term production of the MV-22 and far term production of the MAGTF Family of Fighting Vehicles (MEFFV), future replacement for the LAV and M-1 tank fleets, will invite an opportunity to equip the MAGTFs with technologies to operate consistently at operational distances once that littoral penetration is achieved

Aviation's Increasing Role in Maneuver

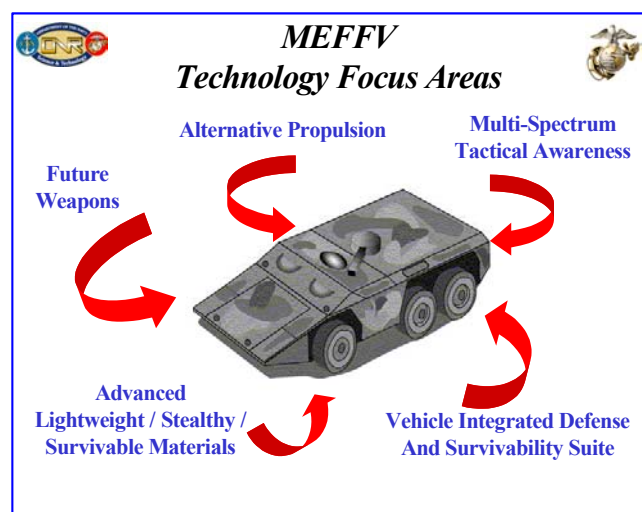
Recognizing the destructiveness and flexibility of air power, the MAGTF will no doubt possess a capability to conduct *STOM* by air, combining seabased air and missile strike operations with seabased air assault.

The greater challenge will be to create a seabased air-ground combined arms force capable of elevating the combined arms dilemma for the enemy from the tactical to the operational level. Designing an air-ground combined-arms force to adeptly accomplish the mobile force role envisioned by Marine Corps *transformation* efforts continues.

The role of air in maneuver will continue to be weighed by both the Marine Corps and the Army over the next 10 years. Air Combat Element capabilities provide the MAGTF a unique advantage in this area and their unique contributions to maneuver will be examined in maneuver concept exploration initiatives.

Advanced Mobility Vehicles

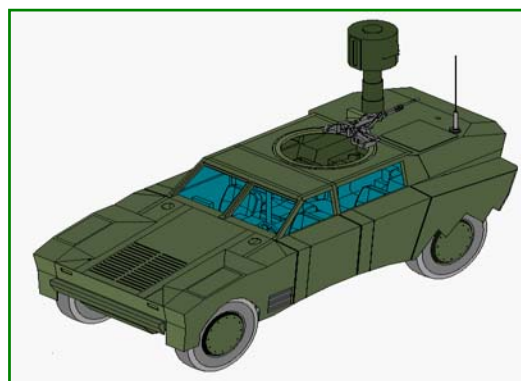
Primarily through wargaming, the Lab is exploring various types of future combat vehicles for employment during seabased operations. Two of the more significant are the MEFFV and RSTAV. The MAGTF Expeditionary Family of Fighting Vehicles (MEFFV) Program has initiated early activities to support design of a vehicle family for the mobile combined arms MAGTF.



Reconnaissance, Surveillance, Target Acquisition Vehicle Program (RSTV)

The RSTV Program is a jointly sponsored DARPA/ONR technology demonstrator established to build a MV-22 transportable, hybrid-electric powered, mobile RSTA suite with advanced survivability features.

The Lab in conjunction with ONR will continue to examine the roles of the RSTV in the air maneuver element of the *STOM* force.



RSTV Concept Vehicle

Other Maneuver Technology Areas

The Lab continues to look for opportunities to collaboratively work with ONR to examine technologies supporting maneuver through several other initiatives. These include:

- Integration of autonomous systems into the operating forces.
- Employment of commercial off the shelf expeditionary engineering equipment.
- Enhanced mine detection technologies and neutralization means.
- Predictive diagnostics to reduce logistic requirements ashore.
- Expanded use of modeling and simulation to support development of future maneuver and mobility systems.

LOGISTICS SUPPORTING FOCUS AREA

Background

The Marine Corps has not been isolated from a sustainment base or distribution channel for thirty or more consecutive days since Guadalcanal. Yet, we continue to foster an “iron mountain” approach to sustainment and accompanying supplies with a corresponding distribution bottleneck to logistics support.

This approach creates an exploitable vulnerability both in the rear area and the vital distribution routes, creates a brake on operational tempo, and is counter to our future concepts for Ship to Objective Maneuver (STOM). There are a number of efforts designed to improve logistics at the national and theater levels, and within the Marine Corps. The 2003 *USMC Logistics Campaign Plan* identifies some of the service specific goals and the organization tasked to oversee this goal.

The Legacy *CSS Enterprise*

From the beginning of the Warrior Series of experiments, the Lab has supported Combat Service Support experimentation initiatives. The Lab’s Combat Service Support (CSS) focus has followed three simultaneous experimentation paths.

The primary path has been that of supporting an operational Force Service Support Group (FSSG) in applying available off-the-shelf technologies to new organizational approaches of supporting the ground combat element in widely dispersed maneuver operations.

Beginning with 1st FSSG during *Hunter Warrior*, the Lab provided limited funding support for the establishment of an experimental Combat Service Support Element (CSSE) organized around information technologies under the title of *CSS Enterprise*.

During *Urban Warrior*, 2nd FSSG followed a similar path in organizing an experimental CSSE as *CSS Enterprise—the Next Generation* with a similar goal tailored for the urban environment. These two efforts led directly to a number of CSS initiatives, one of which was the Small Unit Logistics Advanced Concept Technology Demonstration (SUL ACTD).

The second major approach was the pursuit of organizational concepts and the development of tactics, techniques, and procedures (TTPs) for small unit logistics support in the close battle – specifically the urban battlefield – but with implications to the tactical support of ground combat elements in general.

The third effort is the operational evaluation of new technologies and prototypical equipment with the operating forces in support of Office of Naval Research (ONR) Future Naval Capabilities and Marine Corps Systems Command program managers. Operator assessment has proven to be a successful method of assisting in determining operational priorities for systems acquisition and in developing operational procedures for implementing new technologies by the operating forces.

Organizational Approach – The Lab generally supports a customer in organizing operational experimentation with new technologies, TTPs, and organizations. Typical CSS initiatives are evaluated in limited technical assessments (LTAs) or introduced into the operating forces for sustained operator assessment leading to

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incorporation into a major Marine Corps or Joint experiment in which the CSS initiative supports an experimental concept.

Joint High Speed Vessel

The Lab has the lead for the Marine Corps experimentation effort with the Joint High Speed Vessel (HSV) prototype. During FY 2002, experimentation to explore Amphibious Task Force interoperability, intra-theater delivery of selected equipment, and the role of the HSV as a critical piece of the seabase was explored. This was accomplished through wargames and field experimentation with the operating forces and joint experimentation. Experimentation during FY



03 has been put on hold as the Joint Venture has been deployed in support of on-going real world

operations. Scheduled experimentation included participation in the TRI MEF MPF Exercise, WHEAT/RRDF interoperability and work with EUCOM in the spring. Focus is now on design of X2 as it is being built in the yard in Australia. The schedule for X2 is still being worked. Currently, the first USMC experimentation with X2 will take place during DESTINED GLORY during October of 2003.

Combat Service Support C2

This effort will develop training programs of instruction, standard operating procedures and staff tactics, techniques and procedures needed to command and control mobile combat service support detachments supporting a STOM operation. This is an initiative very closely tied to the FY 04 AWE, Sea Viking, which the Lab is sponsoring. Part of this effort is on-going work with the

CSSE advocate on the Ground Logistics Command and Control effort. This effort is software that provides the MAGTF with automated logistics planning and execution tools that will complement and be interoperable with current and emerging MAGTF, Naval, and Joint C2 processes and systems. This will NOT be a separate C2 capability, but will be the logistics/CSS component of the overarching MAGTF C2 capability and a feeder to the MAGTF's Common Operating Picture

Health Service

Taking care of Marines is more than just a hollow phrase for Marine commanders and our Navy counterparts. MCWL is currently working closely with Defense Advanced Research Projects Agency (DARPA), Marine Corps Systems Command (MCSC) and Marine Corps Combat Development Command (MCCDC) on projects relating to improving medical care for Marines. These projects include enhanced first aid, enroute care system, advanced homeostasis application, a tactical medical coordination system and the health effects of enhanced blast munitions. The results of this work will result in recommended Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities (DOTMPLF) changes. There is also a medical modeling and simulation effort being worked at the Lab.

Forward Area Self Contained Transportable Bulk Liquid (FAST)

In 1996 the USMC realized the need for supplemental fuel carrying capacity on its M1A1 tanks and other armored vehicles. The 55-gallon FLEXCEL met short-term goals but requirements matured and called for a system that would require no external pump or pressure requirements. FAST is a means in

which to package fuel into configurations that support emergent fuel requirements under expeditionary forward operating conditions.

The objective of the FAST system is two-fold: 1) to provide forward operating units with emergent fuel and 2) to supplement current capabilities in the transfer of fuel and other bulk liquids from the sea base to designated points ashore.



Lightweight Water Purification System

This project entails performing a market survey of commercially available LWP systems and performing an evaluation of those systems. The evaluation will be set into



two phases: the first phase will be conducted by Seawater Desalination Test Facility

(SDTF) staff members at NFESC while the second phase will be conducted by the Lab with selected Engineer personnel (Marines) at a location yet to be determined. During the testing phase, data will be gathered to evaluate a system's operational characteristics so a "functional" life cycle cost estimate can be created for each design.

Mine Counter Measures

Mine warfare poses perhaps the most significant challenge to the Navy/Marine Corps team's ability to conduct EMW -- from the stern gate, over the water, across the beach, and to the objectives ashore. The Marine Corps depends upon the Navy to field

the family of systems required to detect and avoid or breach Very Shallow Water (VSW), Surf Zone (SZ) and Beach Zone (BZ) mines and obstacles. Marine forces crossing a beach must be delivered on or beyond the beach in a manner that allows deployment and subsequent movement ashore. Once ashore, the Marine Corps has a requirement to enhance the MAGTF's survivability and to ensure the MAGTF's mobility through mines and obstacles employed individually or as part of an integrated defensive barrier plan. The Marine Corps' current



ground MCM capability is not adequate to meet the MAGTF's mobility requirements. The capability gaps are several, spanning the MCM capability spectrum: detect, breach, clear, proof, mark, and information dissemination. The purpose of this Lab effort is three fold: The immediate effort is to develop a MAGTF Mine Counter Measures (MCM) Capability Set for contingency purposes. A near term effort is to conduct experimentation of route and area clearance items, e.g. medium and heavy flails. The far term effort is to coordinate with ONR 353 to develop improved expeditionary route clearance capabilities.

MAGTF Utility Tractor, Tactical

Recent lessons learned from Operation Enduring Freedom (OEF) have included a lack of Material Handling Equipment (MHE) for the purpose of Rapid Runway Repair (RRR)/Airfield Damage Repair (ADR) and basic field fortification and rapidly constructed revetments. MHE in support of STOM evolutions must be small enough in size for CH-53E transportability, yet durable and rated with an operating capacity to

support Forward Operating Bases (FOBs) during contingency operations. During FY03, the Lab will be engaged with the engineer community/engineer advocate in the assessment of military utility of small, multi-use, utility tractors in support of the Marine Air Ground Task Force (MAGTF).



Modeling and Simulation Tools

The Marine Corps needs computer tools to permit near real time course of action analysis and computer assisted tracking of changes in logistics databases. Both Joint and Service future operational concepts are based on the integration of the theater logistics inventory, the sea echelons logistics capability, and the Marine Air Ground Task Force's (MAGTF) requirements, into a single logistics picture that can support distributed, collaborative planning and execution.

A means to coordinate and monitor the on-going actions in all three distinct, simultaneous cycles – theater inventory, the requirements of the MAGTF, and the planning cycle of the naval task force – is essential to near real time course of action assessment and adaptive planning.

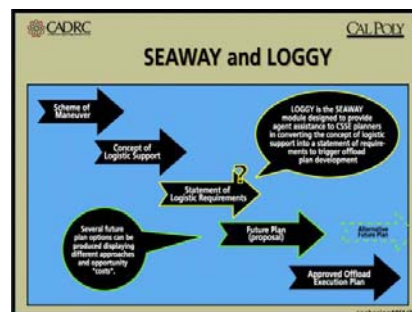
These tools are the next step in providing the decision support systems necessary to integrate operations and logistics such that the decision making process can support rapid, decisive planning, and execution of complex schemes of maneuver on a widely dispersed future battlespace.

During the first quarter of FY 2002, the Lab supported ONR in experimenting with a decision support system that enables adaptive planning and execution. This experimentation, in partnership with the

Naval Warfighting Doctrine Command was a limited objective experiment (LOE) involving an intelligent agent prototype decision support system funded by ONR called SEAWAY and a companion ONR funded MAGTF proof of concept system called LOGGY.

Based on the results of this LOE and strong support from the operating forces,

SEAWAY/LOGGY version 2 was funded with a completion date of fall of 2003. A key element



of version 2 is the capability to develop a nine-day Extended Planning Outlook. Once a commander knows what logistic support is required in order to execute several periods of operations he can then compare it to what stocks he has on hand and what is quickly available from nearby bases, he can identify the delta he still needs and request these critical stocks, he can examine whether the helicopter and LCAC assets he has been assigned are adequate to his projected mission, and he can determine other planning and execution requirements.

WARGAMING

Background

Wargaming is a highly flexible exploratory and assessment methodology that can apply to a broad range of “war” related issues, as well as many outside of “war proper.” For example, gaming methodologies have proven particularly useful in addressing the “combat” of fire and rescue operations, and Weapons of Mass Destruction (WMD) incident response. An operational definition of Wargaming is *“the artificial replication of a situation of competition or conflict not involving actual military force that is characterized by human decision-making which impacts the course of events throughout. It revolves around the interaction of two or more opposing forces guided by predetermined objectives, rules,*

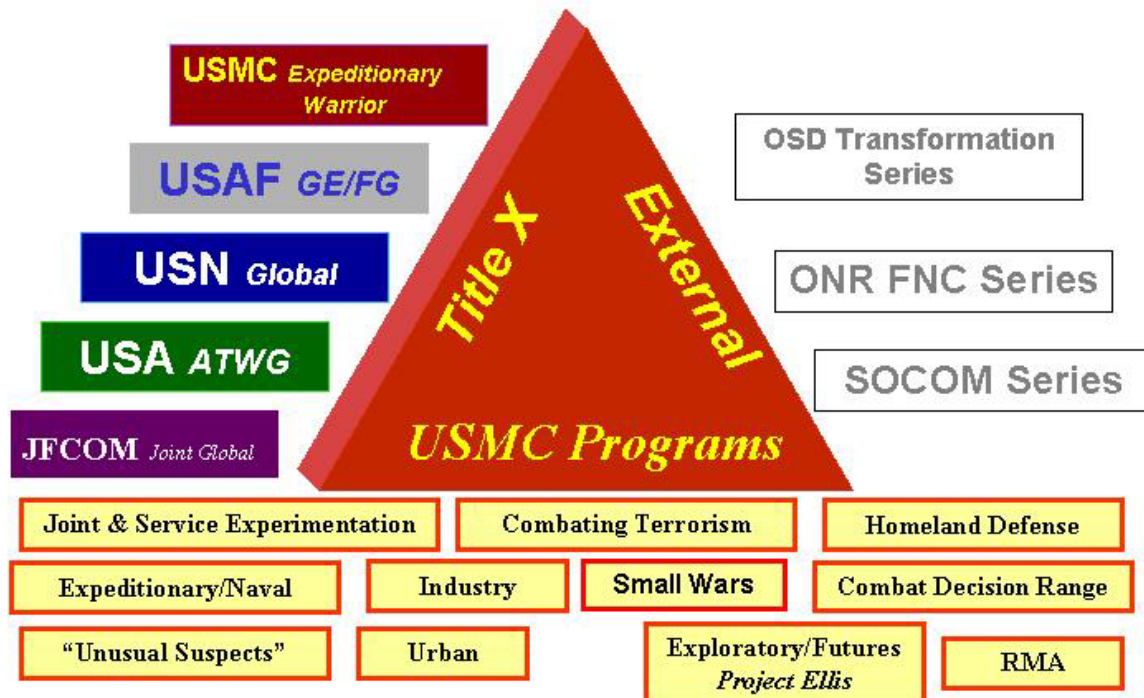
data, and procedures designed to depict an actual or assumed real world situation.”

Wargaming is particularly suitable for generating, refining, and assessing concepts, plans, issues, and technologies; assessing alternatives (courses of action, etc.); identifying capabilities and deficiencies; replicating conditions difficult to reproduce in peacetime; and reducing surprises.

Key Programs

The Marine Corps Wargaming Program, executed by the Wargaming Division of the Lab, is a comprehensive and innovative effort focused on advanced policy, concept, and operational exploration at several levels: Title X Wargaming, Joint and external gaming efforts, and a broad and diverse array of Service programs. This scope is illustrated in the diagram below, and subsequently described in more detail.

Wargaming Programs



Title X Wargaming

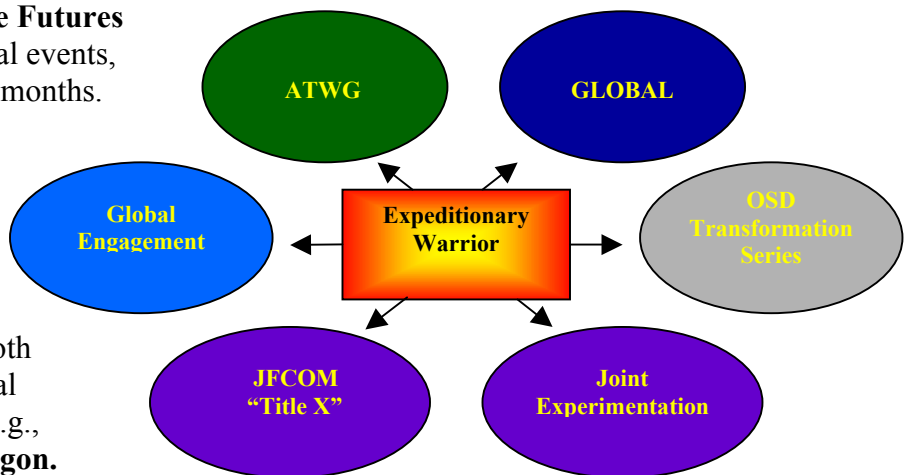
Title X Wargaming consists of two broad components. The first is the management, oversight, and assessment of Marine Corps participation in other Service-sponsored Title X War Games. The second is the execution and assessment of the Marine Corps' Title X Wargaming Program, *Expeditionary Warrior*. Title X War Games generally address future visions and capabilities in the context of core Title X responsibilities of organizing, training, and equipping forces to execute each Service's statutory roles and functions. Title X War Games, sponsored at high levels within each Service, are Joint in the sense of inviting other Service participation, and are expected to have major implications for the future direction and capabilities of the sponsoring Service.

Existing Title X Wargaming Programs sponsored by other Services include the Navy's **Global Series**, the Army **Transformation War Game (ATWG) Series**, and the Air Force's tandem **Global Engagement (GE)** and **Aerospace Futures (FG) Series**. These are large annual events, each with a planning cycle of 8-10 months.

The Title X venue is dynamic in terms of its precise scope and boundaries. For example, Joint Forces Command (JFCOM) experimentation efforts and associated gaming are becoming both increasingly connected to traditional Service-centered Title X gaming; e.g., **Olympic Challenge/Olympic Dragon**. Moreover, JFCOM has indicated a desire to become more heavily engaged in Service Title X programs, as well as the intent to initiate its own "Title X-like" gaming program, at this writing designated *Joint Global*.

In June 2002, the Commandant of the Marine Corps officially approved the re-establishment of a Marine Corps Title X Wargaming Program (in the late-1980s and early-1990s the Marine Corps had pioneered what today is termed "Title X" gaming with the **CMC Policy and Strategy War Game Series**). The new program is designated *Expeditionary Warrior* and is designed considerably differently than the other Service's Title X programs. By contrast, *Expeditionary Warrior* consists of an annual series of smaller, more focused games and related events that can either be connected by a common theme or address discrete issues. The intent is to build in greater speed and flexibility in addressing questions of particular concern to the senior leadership, to focus participation on the question at hand, to leverage other Wargaming efforts for Title X "value added," and to maximize "output" relative to resources expended.

Expeditionary Warrior Program Relationships



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The first event in the *Expeditionary Warrior Series* was held at Quantico on 18-21 November 2002. Labeled Expeditionary Warrior 03-1 (EW 03-1), the event focused on Expeditionary Strike Group (ESG) operations, with the United States Special Operations Command (USSOCOM) forces, to conduct preemptive operations against terrorist forces and bases. The assessment report is currently being written. When it becomes available, notification will be posted on the Wargaming web site: www.wargaming.quantico.usmc.mil.

External War Games

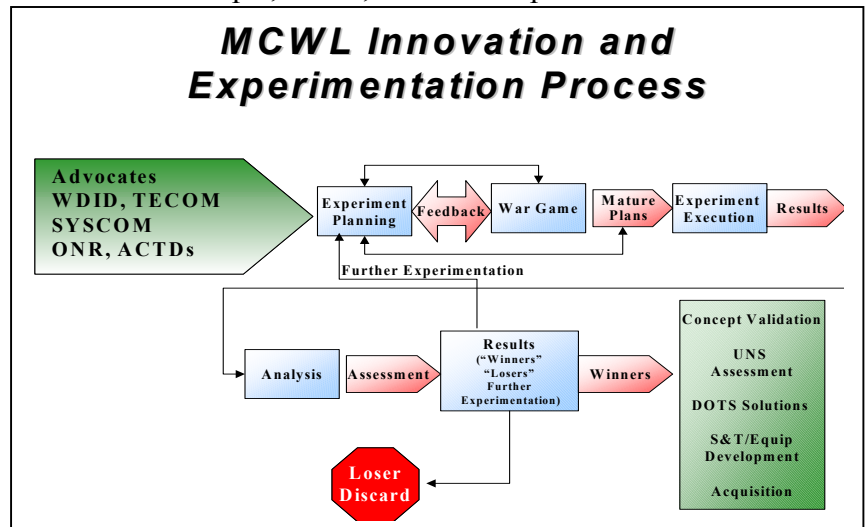
External war games are a broader and less well-defined aspect of the USMC Wargaming effort. Due to their extensive and ill-defined nature, the Wargaming Division must exercise a selective monitoring and participation responsibility. Among the many examples of these games are Office of the Secretary of Defense (OSD) Net Assessment's **Revolution in Military Affairs** and **Transformation War Game Series** gaming efforts, and relevant gaming efforts of other Services not encompassed by Title X programs. By way of illustration, the latter is sponsored by OSD/Net Assessment, OSD/Program, Analysis and Evaluation (PA&E), and the Department of Defense (DOD) Transformation Office, and is focused on testing and understanding the future course of force transformation.

Marine Corps Wargaming Programs

Marine Corps wargaming programs embrace an extensive category of activities that are planned and executed by the Wargaming Division. As such, they are Marine Corps efforts even though many include Joint,

interagency, and even non-governmental participation.

Experimentation Track Wargaming functions as a means of exploring, vetting, and assessing prior to the commitment of resources. A component of the Lab Innovation and Experimentation (I&E) Process, it occurs at the front-end of an experimentation track in order to assess concepts, issues, etc. that shape the direction



of the track as a whole. Examples of experimentation track gaming Include-- the *Urban Warrior*, *Capable Warrior / Culebra*, and *Coalition Warrior Series*. Currently, the thrust of this effort is support of the USMC *Olympic Dragon War Game Series*.

The Combating Terrorism Wargaming Program is, though antecedents are evident in several other Wargaming Programs, a direct result of the 11 September 2001 terrorist attacks against the United States. It is broadly intended to examine the many facets of the global war against terrorism as the first 21st Century war.

- The first component of the this program is *Project Fast Train*, a series of small, fast turn-around "Red Teaming" efforts

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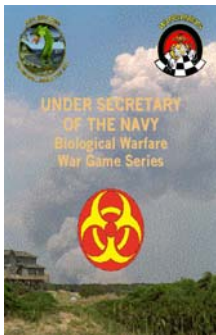
focused on discrete, near-term problems and issues associated with the war on terrorism. Principal participants are retired General Officers and senior DOD civilians.

- The second component is **Project O'Bannon**, an open-ended effort consisting of war games, seminars, and workshops. These events are designed to explore the scope and dimensions of global terrorism and address the elements of a global campaign against terrorism, to include operational issues and appropriate technologies. A wide range of military, interagency, and external participants are involved.



The Weapons of Mass Destruction

(WMD) Series has been ongoing since the mid-1990s. Most recent efforts have focused on biological warfare, especially as it relates to domestic terrorism and Homeland Defense. Additionally, command and control (C2), employment of the



Marine Corps Chemical-Biological Incident Response Force (CBIRF), and Third World nuclear proliferation have been addressed.

Expeditionary/Naval

- **The Tri-Marine Series**, revived in 2001 after a long period of dormancy, is conducted proximate to the annual Trilateral Staff Talks and is expected to continue as an annual effort. The focus is expeditionary operational problems of mutual concern for the U.S. Marine

Corps, the Royal Marines, and the Royal Netherlands Marine Corps.

- **The Industry War Game Series** is conducted in conjunction with the National Defense Industrial Association (NDIA). This program helps maintain a dialogue with industry, and facilitates a larger role for industry in Marine Corps events.

- **The Sea Wolf 2000 (SW2K)** project was a result of the January 2000 Navy-Marine Corps Warfighter Conference. Its purpose was to assess the effects of the combat power of forward-deployed naval forces and immediate follow-on forces in early decisive combat operations in order to illustrate the unique, integrated capabilities of the Navy-Marine Corps Team. Sea Wolf provides an excellent Marine Corps-Navy gaming venue, though at present it is not a regularly scheduled event. The intent is to attempt to institutionalize the program as a regular venue for Navy-Marine Corps to address issues of mutual concern.



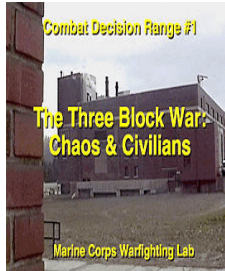
The Dynamic Decision-Making Series

examines principally non-military organizations to leverage insights into decision-making and command and control issues applicable to the digital, nonlinear battlefield of the 21st Century. Previous organizations studied include the New York Mercantile Exchange (NYMEX), the Federal Aviation Administration (FAA), the Fire Department of New York (FDNY), and Silicon Valley Information Technology (IT) executives. Prior to 11 September, preliminary discussions concerning a project

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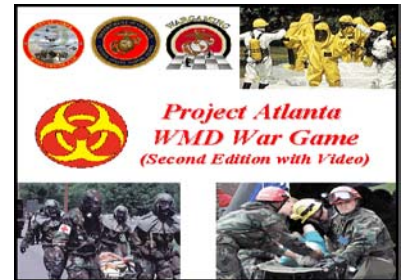
with the NYPD were underway, the future of which is indeterminate at this time.

- **The Combat Decision Range (CDR)** is a tremendously successful program that developed out of the larger, previously described Dynamic Decision-Making Series. In concept it is grounded in the FDNY's Battalion Chiefs' Course. The CDR provides a facilitated, computer-driven, human interactive, decision-making program for combat leaders from the noncommissioned officer through field grade ranks. It is fielded throughout the operating forces. To date, 27 modules focused on different operational problems have been developed. The CDR transitioned to the Training and Education Command (TECOM) during Jan 2003.



- **The Urban Warfare Wargaming Program** embraces a broad and diverse spectrum of activity that has cut across other Wargaming program lines. These have included Joint Wargaming efforts, the Urban Warrior and Project Metropolis experimentation series, Revolution in Military Affairs (RMA), US/UK Urban Non-lethal Weapons Wargaming Program, Project Ellis, Small Wars, and Cultural Intelligence seminars. This effort also integrates with the activities of the National Institute for Urban Search and Rescue (NIUSR), which also tie closely with Homeland Defense described in the following paragraph.
- **Homeland Defense** focuses on the multifaceted issues of military support to civil authority. Much of the context for

this effort has been chemical/biological incident response, particularly in antiterrorism scenarios that potentially involve the Marine Corps' CBIRF, now part of the 4th MEB (AT). A number of war games have been directed toward this end, particularly **Project Atlanta**, a congressionally mandated effort exploring new technologies and critical organizational and command and control issues



involved in military support to civil authority. Current efforts include collaboration with the Fire Department of New York (FDNY) regarding the establishment of a wargaming program to address planning scenarios, course of

action development, and operational decision-making, as well as to make available appropriate Lab

technologies to address specific FDNY operational issues. A modified version of the CDR is being offered for their use as well. The Homeland Defense effort also supports a HQMC-sponsored project with the NYPD concerning the possible use of Marines in security events. **Project NCR (National Capital Region)**, an ongoing program, has examined insights and lessons learned from 11

September 01, and was originally intended to assist the CBIRF in

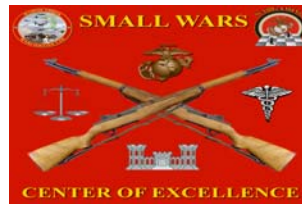


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integrating with the NCR, and specifically the Military District of Washington (MDW). Its future direction is ambiguous at this time. The recent establishment of Northern Command and the establishment of a Department of Homeland Defense are likely to generate significant efforts in this arena.

- **Small Wars** provides a venue to examine the aspects and issues associated with that operational area traditionally known as Small Wars and more formally as Operations Other Than War (OOTW).

In 1999, at the direction of the Commandant, a ***Small Wars Center for Excellence*** was established consisting of a dedicated web site and contractor Subject Matter Expert support, supplemented when required by matrixed Wargaming Division assets.

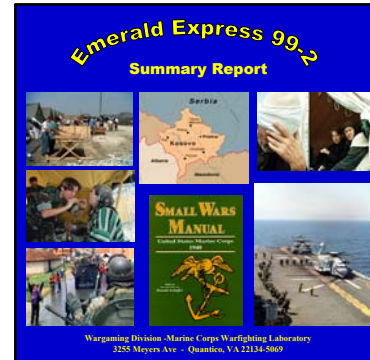


Another key component of the Small Wars program is the ***Cultural Intelligence Seminar (CIS) Series***.



Designed to provide a “missing piece” in military planning, the CIS series focuses on developing a better understanding of cultural issues in regions where USMC forces may be deployed in Small Wars situations. Non-defense agencies and Non-Governmental Organizations (NGOs) are the primary participant pool, with Marines being the ultimate beneficiaries.

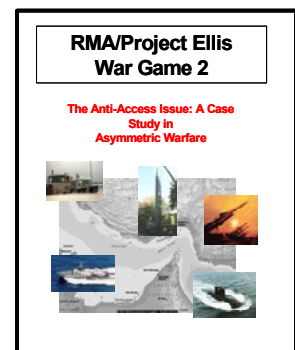
The final, and equally vital component of the Small Wars Program is the ***Emerald Express Series***. It is designed as a



“lessons learned” venue to garner key insights from actual operations, e.g. the 26th Marine Expeditionary Unit’s (MEU) experiences in Kosovo and Turkey.

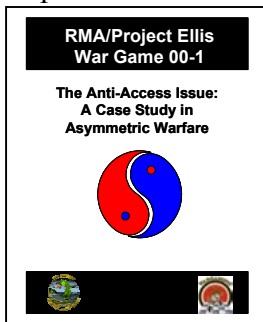
- **Exploratory/Futures Gaming** is a long-range, open-ended effort to explore future and emerging operational concepts, organizations, technology, and “strategic futures,” among other topics.

The first component of this effort is ***Project Ellis***, which examines pivotal shifts in the strategic landscape that may result in major changes to US military strategy and the role of the Marine Corps. Named for Major Pete Ellis, whose identification of the shifting strategic landscape in the Pacific and the corresponding need for distinctive military capabilities had a decisive effect on the outcome of World War II. Project Ellis has examined, through workshops



and war games, such issues as changing strategic assumptions, asymmetric warfare, counter anti-access strategies, and the impact of quantum technology shifts.

The second component is the ***Revolution in Military Affairs (RMA) Series***, conducted under the aegis of OSD/Net Assessment, and oriented toward issues of particular interest to the Marine Corps



in that context. Conducted since 1995, it has covered an eclectic range of problems and issues to include support to Project Ellis, urban

warfare, experimentation assessment, future OMFTS concepts, biological warfare, non-lethal weapons, and, quite significantly, an extensive Information Warfare (IW) effort. Exploiting industry as well as military expertise, the IW effort is directed toward computer network attacks against critical infrastructures.

Current ***Project Ellis*** and ***RMA*** efforts are focused on supporting the war on terrorism, more specifically ***Project O'Bannon*** and possibly ***Expeditionary Warrior*** depending upon how that program evolves.

EMERGING, THREATS AND OPPORTUNITIES

Center for Emerging Threats and Opportunities (CETO)

The Center for Emerging Threats and Opportunities (CETO) is a think tank dedicated to developing new ideas for the Marine Corps. It was established in November 2000 at the direction of the Senate Armed Service's Subcommittee on Emerging Threats and Capabilities out of a growing concern for the wide range of security challenges the U.S. will face in the 21st century. CETO operates as a division of the Warfighting Lab.



CETO's mission is to prevent operational and tactical surprise to senior warfighting commanders by assessing the future security environment in light of emerging threats and potential conceptual and technical opportunities.

The center aims to serve as a catalyst to stimulate thought and debate on issues of importance to the Marine Corps. CETO also responds to requests for support from the

senior warfighting commanders. Its primary products are seminars, briefings, reports, assessments, and articles. The following projects represent the focus of CETO's efforts during FY03:

Base Security Assessments

As part of a continuing effort to assess Marine Corps base security, CETO is conducting a security study of Marine Barracks, 8th and I. CETO recently completed a report on technology enhancements to improve security and enable enhanced command and control for III Marine Expeditionary Force (MEF) and Marine Corps Base, Camp Butler. The report is based on a security assessment conducted last June in Okinawa, Japan.

Enhanced Blast Weapons

Under the direction of the Lab and in coordination with Marine Corps Systems Command, CETO has been assisting in developing a new enhanced blast weapons capability. In addition, CETO has been developing tactics, techniques, and procedures for defense against and employment of enhanced blast weapons by Marine operating forces.

Forcible Entry Study

Two research fellows are part of a DoD and Joint Services team conducting a study on forcible entry operations. The study is based on a December 2002 DoD Program Decision Memorandum (PDM) and is sponsored by the Chairman, Joint Chiefs of Staff; the Office of the Secretary of Defense (Acquisition, Technology, and Logistics and Program, Analysis, and Evaluation); and the Services.

The CETO team is supporting the USMC portion of the study by analyzing equipment, amphibious ships, maritime pre-positioning,

the sea-basing concept, and the development of air capability ships. The project is expected to last until August 2003 and will be conducted at the Pentagon.

Child Soldiers: Implications for US Forces

More than 300,000 children under the age of 18 are under arms fighting as soldiers in the more than 30 conflicts around the globe. It is inevitable that U.S. forces will face child soldiers in the future. CETO's project on child soldiers examines ways that Marines can better plan and deal with this phenomenon. Through ongoing cultural intelligence seminars, CETO aims to educate and train Marine operating forces about the child soldier phenomenon.

- CETO initiated its project with a cultural intelligence seminar on 11 June, 2002, in Quantico, Va. on ***Child Soldiers: Implications for U.S. Forces.***



- CETO is working with Training and Education Command and the operating forces on training programs for deploying units that include the development of lesson plans and the identification of experts to participate in exercises, wargames, and seminars. CETO also will address potential changes to doctrine.

Cultural Intelligence Seminars

Marine forces often deploy on short notice to countries where they have limited experience and familiarity. CETO, in conjunction with the Marine Corps Intelligence Activity (MCIA), conducts Cultural Intelligence Seminars for deploying units as part of their routine training program prior to deployment. The seminars provide timely and tailored training focused on cultural aspects of specific countries and regions or on functional issues. CETO also conducts these seminars and Professional Military Education seminars for other Marine Corps operating forces as requested.

Regional Area Studies

CETO's Regional Area Studies Project aims to identify and understand potential regional threats around the globe and attempts to develop ways to deal strategically with threats before they become problematic in the future.

Distinguished author and futurist Ralph Peters is working with CETO on this effort by conducting field research and preparing reports on the strategic threats and opportunities he identifies. To date, he has conducted studies of India and Indonesia. He is currently conducting a study of South Africa.

Flashpoints for Future Conflict

CETO researchers are examining six critical factors to assess the countries or regions across the globe that may remain or become flashpoints for future conflict. The factors being examined are water (scarcity and conflict), energy, poor governance, HIV/AIDS, demographics, and religion -- all factors that have and will continue to have an impact on the balance of world security.

Small Wars II

CETO is writing a new Small Wars Manual as an updated complement to the Small Wars Manual of 1940. Small Wars II is part of a larger project, spearheaded by MCWL, that includes the Operations Other Than War website as its centerpiece. The website aims to be a dynamic, one-stop resource for information and current thinking on Small Wars. In addition to the new Small Wars Manual, the website will contain lessons learned; up-to-date tactics, techniques, and procedures; and a discussion list.

ACMC Think Tank Taskers

As previously mentioned, one of CETO's main goals is to stimulate thought and debate on issues of importance to the Marine Corps. CETO provides this service to the Marine Corps leadership in the form of high-level "food-for-thought" briefings, followed by written reports with recommendations. The Marine Corps leadership will request specific issues for CETO to examine throughout the fiscal year. Ongoing issues for examination include:

- **Marine Corps Transformation.** CETO is comparing Army and USMC transformation efforts by identifying the challenges and opportunities for the Marine Corps given the two different strategies. CETO examined why and how the USMC needs to change for the future. CETO also explored ways to leverage Army transformation efforts.
- **MAGTF Organization.** As an off-shoot of the larger Marine Corps Transformation effort, CETO is exploring how the USMC should organize in the future to respond to asymmetric threats in an increasingly uncertain world.

- **USMC 2015.** CETO is supporting a Strategic Initiatives Group(SIG) led effort to determine how the Marine Corps will conduct operations in 2015. More specifically, the group will assess the security environment and how the USMC will be organized and how it will operate. The SIG is a think tank for the Commandant of the Marine Corps. This task was assigned by the Secretary of Defense.

Support to Wargames, Symposia & Conferences

CETO's research fellows will continue to make substantial contributions to several high-level wargames and conferences related to DoD and USMC transformation and future capabilities.

Command and Control Integration (CCI)

Purpose: Develop an advanced, object-oriented database and multi-system translator that enhances the commander's ability to make decisions and manage the battlespace by providing the capability to synchronize data across the currently fielded command and control systems within the maneuver, intelligence and fire support functional areas.

Background: Existing Marine Corps C4ISR architecture systems are not designed to present a consistent Common Tactical Picture (CTP). Maneuver, intelligence and fire support applications are not synchronized and there is no common source of trusted battlefield information. Therefore, the information portrayed in combat operations centers is often inconsistent, suffers from dissimilar timing delays, and there is no uniform method to allocate network resources across the applications. The lack of a reliable CTP that can be accessed by tactical units at the infantry regiment level and below, over the existing communications paths, is a significant shortcoming that CCI proposes to address.

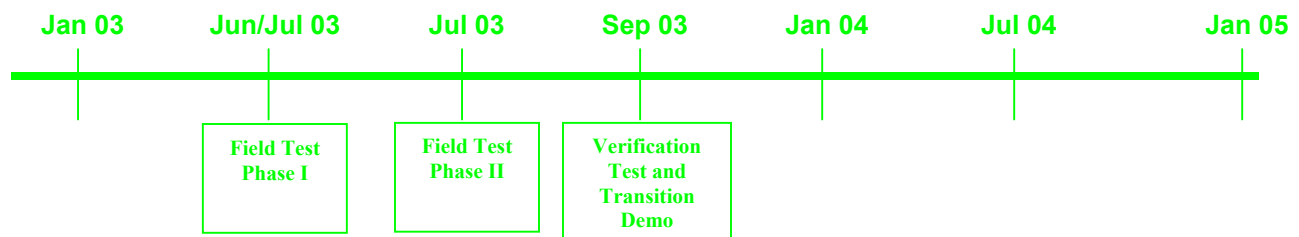


Description: The principal components of CCI include:

- An internal Object Model created in UML of all battlefield entities such as friendly and enemy assets, overlays, and operational events.
- Object serving communication software (Shared Net) that provides facilities for object subscription, replication and synchronization, and adds replicated namespace hierarchy to object model.
- The Shared Net Object Instance Store (SNOIS), a single software package that integrates the object model within the communication services framework.
- The CCI Translator, which provides transparent, bi-directional translation with existing systems into common object format, and work flow rules for routing information between formats and systems.

Deliverable Products: The Lab has a Technology Transition Agreement with Marine Corps Systems Command with planned transition of CCI software at end of FY-03.

Milestones:

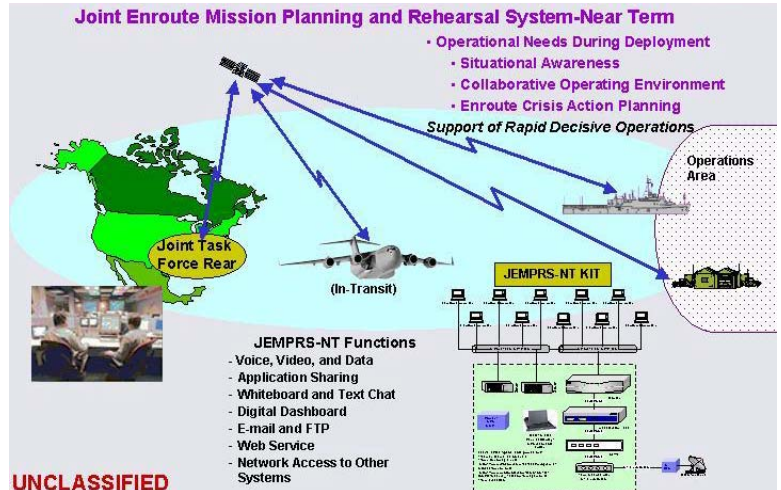


Action Officer: (703) 784-1331

Collaborative Planning

Purpose: This effort will assess current and near term available tools that enhance collaborative planning and as required will develop tactics, techniques and procedures (TTPs) for employment by Marine forces.

Background: Existing Marine Corps collaborative planning is not state of the art. Today's seabased forces use precious assets to cross-deck personnel to do mission planning. The Command Element Advocate has identified a need to determine the information exchange requirements and appropriate collaboration tools for each echelon of the MAGTF. This effort, if successful, will alleviate the cross-decking requirement and enable staffs distributed on different platforms in the seabase to conduct collaborative planning. The ability to plan a common operation while planners are at distributed sites will preserve assets, save time and ensure everyone understands commander's intent as the operations plan is built collaboratively.

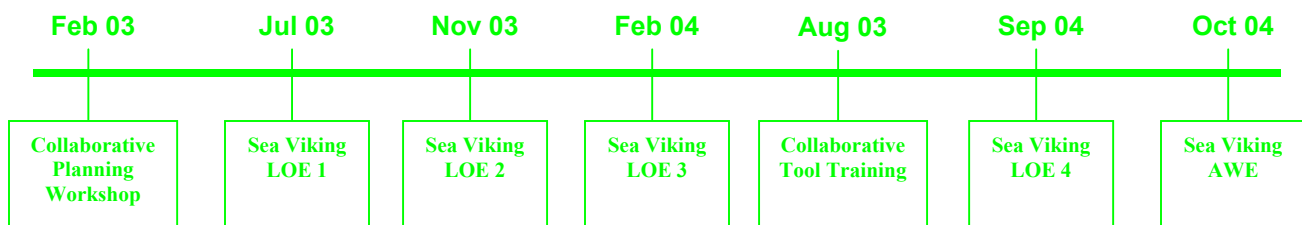


Description: The Lab will examine capabilities to support three areas of collaborative planning:

- Between the MEU and all major subordinate elements while the MEU is underway to enhance planning with minimal cross decking. Potential tools and communications capabilities are the Defense Collaborative Toolset, Digital Wide Transmission System and VRC-99 radio.
- Between the commanders and staffs located at the seabase and those operating ashore. Program of record C2 systems (C2PC and AFATDS) operating over an Iridium network will be assessed.
- Between a MEB fly-in command element and the MEU to maintain required C2 capabilities while en-route from home station to the JOA. The likely candidate is the Joint Enroute Mission Planning and Rehearsal System (JEMPRS).

Deliverable Products: Assessment reports and TTPs.

Milestones:



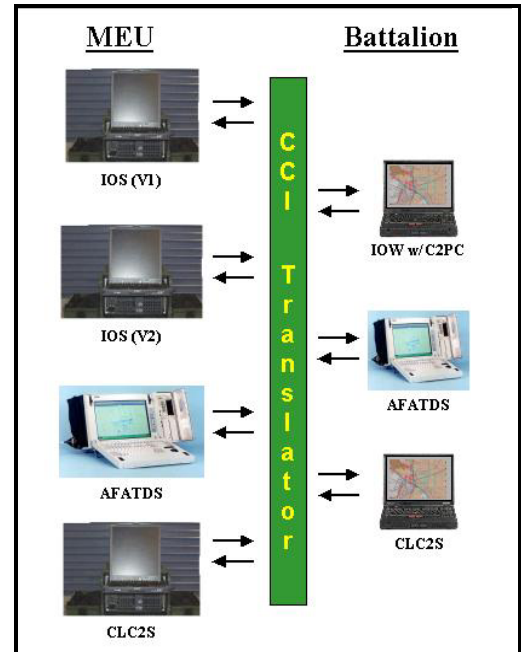
Action Officer: (703) 784-1468

Digital Combat Operations Center (DCOC)

Purpose: This effort will develop programs of instruction (POIs), standard operating procedures (SOPs) and staff tactics, techniques and procedures (TTPs) needed to employ MEU and infantry battalion level C2 systems fielded as of 2004. Additionally, the effort will develop experimental equipment and TTPs that provide interim enhanced capabilities to a 2004 deploying MEU.

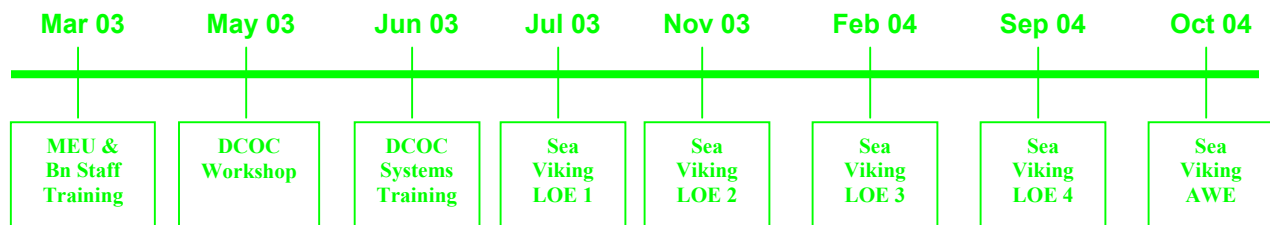
Background: Existing Marine Corps C2 systems do not synchronize the maneuver, intelligence, logistic and fires applications to create a common tactical picture (CTP). Much software and hardware has been issued to operational units under various “stovepipe” programs of record in an effort to leverage the benefits of the digital age. However, there currently exists a digital divide within and between staffs of all headquarters, MEF, division, regiment, battalion and company. This digital divide stems from the disparate training experiences of individual Marines within these staffs and an overall lack of common SOP’s for digital operations.

Description: The DCOC team will develop an integrated set of enhancements to MAGTF command and control in the areas of systems, staff action, and training with a focus on a MEU CE and Infantry Battalion HQ. Limited functions of the CSSE, and ACE HQs will also be included. Starting with program of record C2 systems available as of 2004, the DCOC team will develop the hardware and software that includes a common database accessible by C2PC, CLC2S, AFATDS and IOW. The technical solution for this effort will be based on Command and Control Integration (CCI). The common database provided by CCI will hopefully improve development of a CTP and streamline staff information management processes. In order to fully exploit both current C2 systems, and the enhanced systems being developed by the Lab, the DCOC team will expand upon currently available training to include systems training and MEU/Infantry battalion staff SOPs. The DCOC is supported by and integrates the following initiatives: CCI, OTM COC, CLC2S, ETCS.



Deliverable Products: POIs, and SOPs for current and enhanced C2 systems.

Milestones:

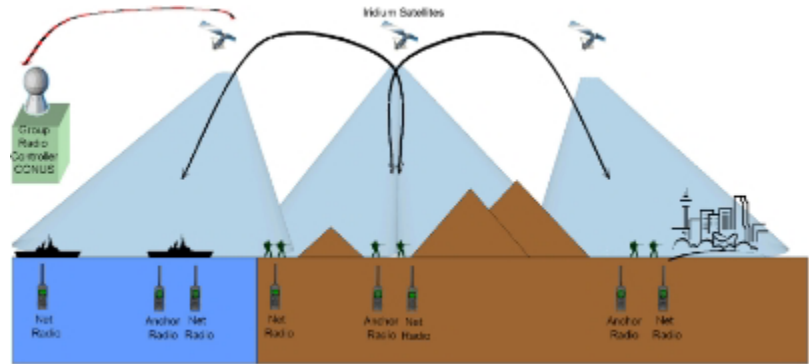


Action Officer: (703) 784-1468

Expeditionary Tactical Communications System (ETCS)

Purpose: The Lab is developing the ETCS in order to examine command and control during *Ship to Objective Maneuver (STOM)* and to provide and interim capability to a deploying Marine Expeditionary Unit (MEU) that could support STOM.

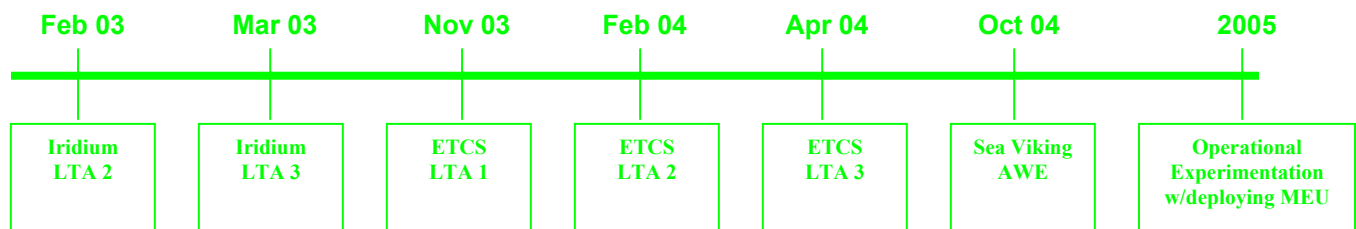
Background: There is a need in the Marine Corps for an over the horizon (OTH) and on the move (OTM) communications capability to link tactical maneuver units and platforms with each other and back to fire support assets and the command element. The envisioned system must provide wide area 24/7 coverage, assured access at all levels in complex terrain, OTM capability, tactical level security and a robust network that does not need ground-based infrastructure. A tiered system architecture is needed to meet this requirement. This system architecture will potentially consist of a combination of tactical and high altitude unmanned aerial vehicles, and a near space segment (Low earth orbit (LEO) and Medium earth orbit (MEO) satellites). The requirement is addressed in the EMW Tactical Communications Relay Universal Needs Statement (UNS) #01082UA.



Description: ETCS is based upon the commercial IRIDIUM system, modified to provide a push-to-talk netted (one to many) voice and data capability. It will provide OTH and OTM communications between the seabased C2 nodes and elements ashore down to the dismounted company commander and reconnaissance team. This effort will include the integration of ETCS into Marine Corps C2 systems (IOS, AFATDS, CLC2S, DACT, etc.), to include OTM COC platforms to enable the passage of data in support of a common tactical database being developed by the DCOC team. In conjunction with the RSTA team, ETCS will also be integrated to link an unmanned ground sensor (UGS) to the seabase. ETCS will be installed on each ship in the Amphibious Ready Group. At the conclusion of experimentation by a deploying MEU, the Lab will provide lessons learned and refined requirements statements to MCCDC for a long-term solution for MAGTF OTH communications.

Deliverable Products: Prototype system for operational experimentation and requirements documentation.

Milestones:

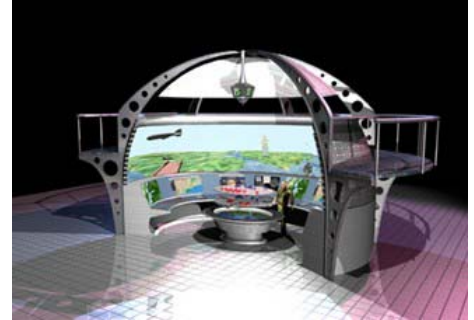


Action Officer: (703) 784-4211

Human Decision Making and Command and Control

Purpose: Develop the concept, design, and elements of a prototype command post of the future, integrating fundamental research and experimentation utilizing military commanders and existing command post technology, and also integrating the Marine Corps future concept for command and control (C2).

Background: Project Albert has been participating in, and lending support to, the recently formed Marine Corps Combat Development Command (MCCDC) Command Element Integration Working Group (CEIWG). In addition, a six-year collaborative agreement between the Marine Corps Warfighting Lab and the Swedish National Defense College (NDC), which performs fundamental research and experiments using military commanders and existing command post technology, has recently been signed. Project Albert has also been working on distillation simulations of combat and been working on synthesis and visualization techniques for the past four years. All of these efforts naturally dovetail to accomplish the above stated purpose.

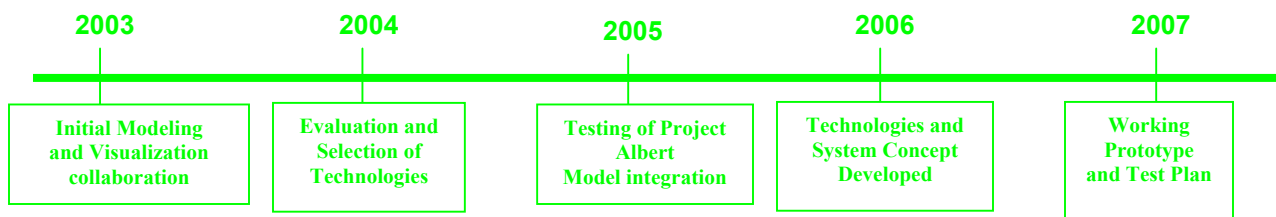


Description: The following will be accomplished under the collaborative agreement: (a) Evaluate current technology for agent-based simulations, research on human psychology, visual representations and forms of interaction. (b) Assess, select, develop, and enhance distillations on tactical, operational and strategic levels of conflicts across the spectrum of intensity and lethality to include those that include intrinsic human characteristics; across levels of fidelity. (c) Develop and test variable fidelity models of agent-based simulations including intrinsic human characteristics, visual representations and forms of interaction. (d) Develop and test preliminary system concepts for distillations including intrinsic human characteristics, visual representations and forms of interaction, and advanced experiments.

Project Albert will also integrate CEIWG recommendations across all areas of research and development. The CEIWG is developing a comprehensive capabilities-based C2 plan that supports the commander's requirements to conduct operations in the execution of Expeditionary Maneuver Warfare (EMW) scenarios in 2009 and beyond, and synchronizes doctrine, organization, training, material, leadership, personnel and facilities (DOTMLPF) actions necessary to enable C2 in support of EMW.

Deliverable Products: Assessment report describing the concept, design, and elements of a C2 prototype, plus working elements of that prototype, and DOTMLPF recommendations.

Milestones:



Action Officer: (703) 784-5175

Improved Airborne Command & Control Capability (IAC3)

Purpose: To develop an advanced airborne command and control (C2) platform to provide a line-of-sight and over-the-horizon situational awareness capability to the GCE commander while airborne in any USMC aircraft capable of being a C3 platform, (i.e. UH-1, H-46, H-53, C-130, C-12 and V-22) and allow for seamless integration with legacy and future communication systems.

Background: In the mid-1970's, the ASC-26 was developed as a C2 system for the H-1 helicopter. It allowed the maneuver commander to command his forces while airborne. Recent technology has rendered the ASC-26 obsolete leaving mission coordination to be conducted via organic aircraft radios (ARC-210), often by the aircraft commander. Advancement in software-defined radios reduces the size/weight impact and now makes them desirable for airborne C2. In August 2000 an effort to reinvent the ASC-26 became known as the IAC3. A Preliminary Design Review was conducted in October 2000 and the first prototype was developed using off-the-shelf components. Results gained from testing and assessments identified areas for further modification, including: rack design, workstation orientation, antenna selection and improved man-machine interface. The Naval Research Lab was tasked to construct and provide this improved capability for participation in Kernal Blitz Experimental (KB (X)) 2001. The results of the initial LTA, conducted in the spring of 2001, determined that the technology was immature and not ready for participation in KB (X). After a fourth LTA, conducted in Nov 2002, the IAC3 was only capable being included in future experimentation but was deemed not ready for operational use.



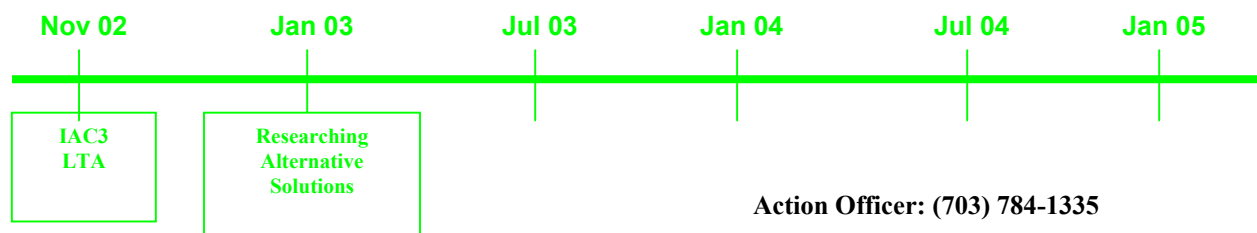
Description: The IAC3 is a potential ASC-26 replacement package:

- Surrogate Joint Tactical Radio System (JTRS) software defined radio.
- Supports SINCGARS, UHF, VHF, narrowband SATCOM.
- Data capability using SINCGARS/SATCOM to provide ground Command and Control Personal Computer (C2PC) picture to the airborne platform.
- Supports four radio channels simultaneously.

This initiative supports the Marine Airborne Command and Control Console UNS (Draft) and the Universal Communications Interface Module (UCIM) program of record.

Deliverable Products: Prototype system that supports the UCIM program of record as the experimental airborne platform.

Milestones:



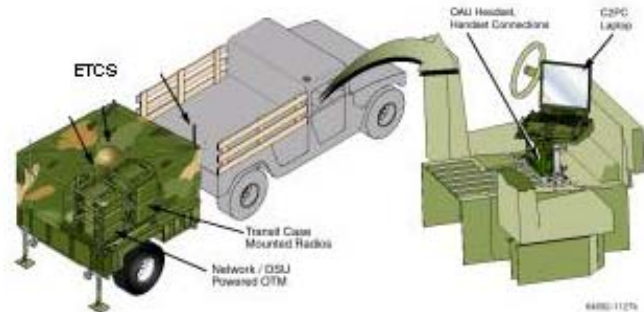
Action Officer: (703) 784-1335

On the Move Digital Combat Operations Center

Purpose: To provide an On the Move (OTM), Over the Horizon (OTH) Digital Combat Operations Center (DCOC) to the infantry battalion commander for surface and vertical employment during *Ship to Objective* Maneuver (STOM).

Background: STOM operations require the ability to rapidly maneuver over an expanded littoral battlespace. The STOM battlespace is non-linear, without a secure rear unit COCs. This environment requires COCs that can operate on the move, both voice and data. Since the command element COC is seabased, they will also require OTH communications. The Lab's *Sea Viking*, STOM focused experimentation, will require an OTM/OTH COC capability

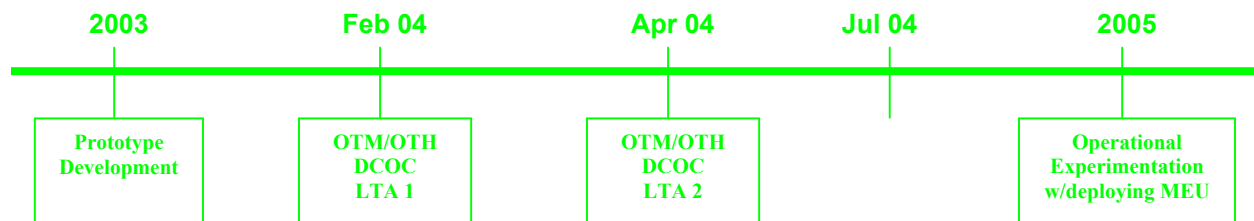
both for experimentation in a 2004 advance warfighting experiment and for continued operational experimentation by a deploying MEU in 2005. In order to provide this capability, the Lab is partnering with Marine Corps Systems Command (MCSC), the Office of Naval Research (ONR) and industry to develop an experimental OTM/OTH DCOC.



Description: The Lab is partnering with MCSC's Unit Operations Center (UOC) and Advance Amphibious Assault Vehicle (AAAV) programs, ONR's Littoral Warfare Future Naval Capability program and General Dynamics to explore integration of the Lab's OTH Expeditionary Tactical Communications System (ETCS) and on the move capable C2 systems (C2PC/AFATDS/CLC2S) into battalion COC platforms. Platform options are an integrated COC in a sheltered HMMWV and multiple wirelessly connected HMMWVs. In addition to COC platforms, this effort will integrate ETCS into a CH-53E and Interim Fast Attack Vehicles (IFAV). Helicopter integration will enable voice/data communications by the battalion or company commander while enroute to the objective. Integration of ETCS and the Mounted Data Automated Communications Terminal (DACT) into the IFAV will provide OTH/OTM communications to the vertical assault company commander.

Deliverable Products: Prototype system for operational experimentation and requirements documentation.

Milestones:



Action Officer: (703) 784-1335

Tactical Voice over Internet Protocol

Purpose: To improve tactical digital communication quality and quantity by inserting voice over Internet protocol (VoIP) hardware and software at all tactical echelons. The incorporation of VoIP may alleviate the need to have two distinct communications networks (one voice, one data) by consolidating them into a single multi-service network while providing an enhanced quality of service.

Background: As data requirements increase for combat units, there is increasing competition for communications assets between data and voice nets.

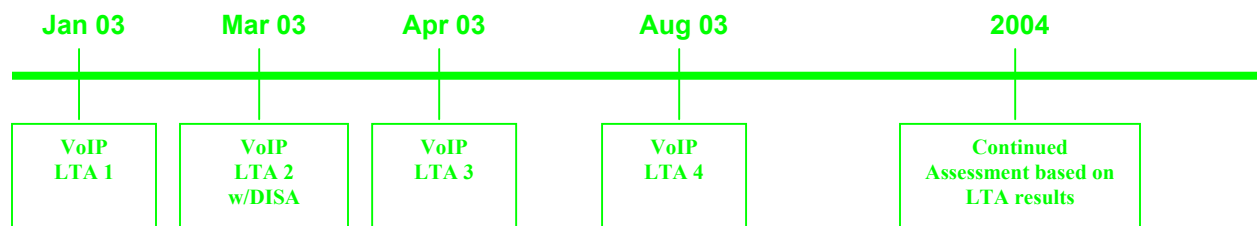
Description: Voice over Internet Protocol or (VoIP) as it is more commonly referred to provides a method of transporting voice communications over existing data networks. This ability to “converge” our communications systems may allow the deployment of only one communication network where we currently deploy several. Improving the quality of communication both in voice and data format, streamlining the asset requirement to provide those communication paths and allow for remote management and control.



The Lab will conduct limited technical experiments (LTAs) with a “converged” communications infrastructure to evaluate the benefits of providing VoIP technologies to field units for use over tactical networks. Testing of VoIP will include configuration and setup, deployment, standardization, measurable Service Level Agreements and evaluation over a variety of data paths.

Deliverable Products: Assessment report on the concept of integrating VoIP with battlefield digital communications. If experimental results are positive, requirements documentation with recommended hardware and software, as well as tactics, techniques and procedures will be developed.

Milestones:



Action Officer:(703) 784-4534

Project Phoenix

Purpose: Project Phoenix has a three-fold purpose. To continue the assessment of the M3M .50 cal weapon system aboard assault support helicopters to determine if it can effectively meet the requirement for a common defensive weapon system. To examine rotary wing aircraft effectiveness and survivability during urban operations. To discover and evaluate enabling technologies and training devices to aid the aviation fleet in training against MANPAD threats.

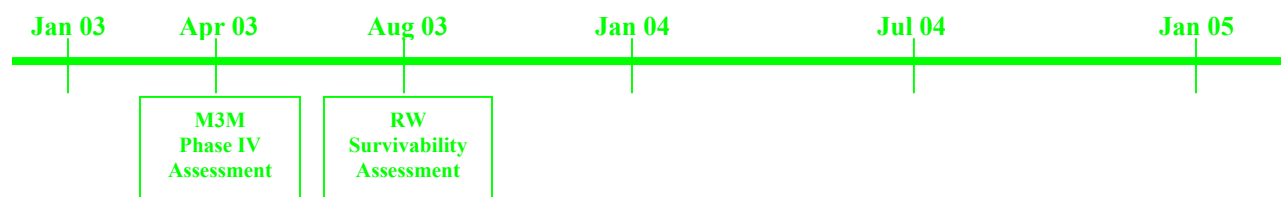


Background: The Lab began examining the urban environment in 1998 as part of the Urban Warrior series of experiments and has continued urban experimentation through Project Metropolis. Project Phoenix originated during Project Metropolis experimentation and was formed to examine the aviation aspect of urban operations. Project Phoenix has focused on examining the survivability of rotary wing (RW) assets against MANPAD and AAA threats in the urban environment. At the same time, close-air support (CAS), CASEVAC, resupply, assault support, and reconnaissance operations have been examined to determine the effectiveness and ability of aircrews to perform these missions in an urban environment with various threats. In 2001 Project Phoenix was designated to assess the effectiveness and utility of the M3M .50 caliber weapon system as a possible system to meet the requirement for a common defensive weapon system (CDWS) for our assault support helicopters. The assessment is being done in cooperation with MAWTS-1, NAVAIR, HQMC, HMX-1, and Fabrique Nationale (FN). The third phase of a four-phased assessment was recently completed at MAWTS-1.

Description: Project Phoenix examines the effectiveness of current tactics used by RW aircraft conducting urban operations and then incorporates different methods, such as using sniper assets to suppress enemy air threats, to determine the tactics' ability to enhance aviation's support during urban operations. In addition Project Phoenix will continue the assessment of the M3M .50 caliber weapon system. The fourth, and final phase will include assessment of the M3M on the CH-46E, CH-53E, and UH-1N. The assessment is beginning the transition to Naval Air Systems Command where PMA-242 will be the program office. This effort will be conclude by the end of FY '03.

Deliverable Product(s): Assessment reports and recommended changes to tactics, techniques and procedures.

Milestones:

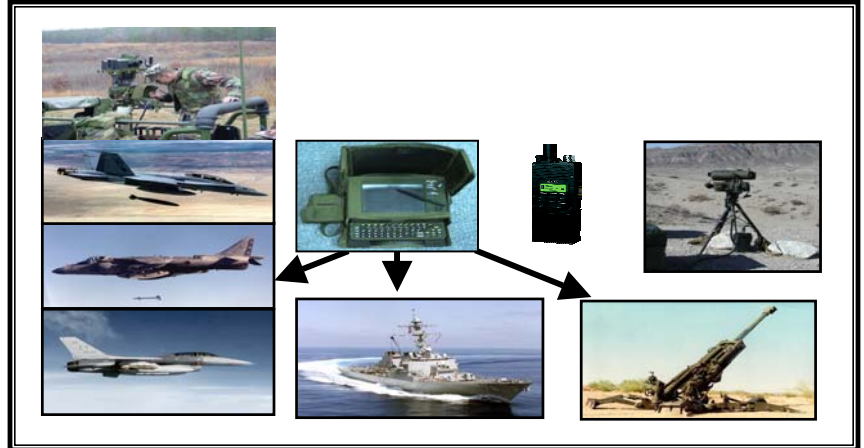


Action Officer:(703) 784-3785

Target Handoff System Experimental THS(X)

Purpose: THS (X) provides a universal combined arms targeting software that enables precision target location and digital mission hand off to fire support agencies.

Background: The Lab has been in support of Marine Corps Systems Command's (MCSC) Target Location Digital Handoff System (TLDHS) Program Manager in developing a material solution to the TLDHS Operational Requirements Document (ORD). The best components of three Lab efforts; the Advanced Close Air Support System (ACASS), Universal Combined Arms Targeting System (UCATS) and Precision Target Acquisition Mobile (PTAM) have been combined into one effort—THS (X). In June 2002, the Lab and MCSC established a technology transition agreement to transition THS (X) software into the TLDHS program.

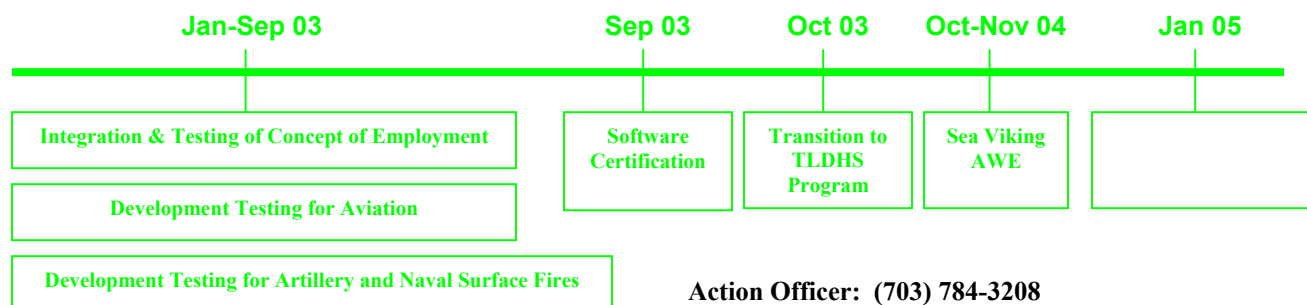


Description: THS (X) is comprised of the following components:

- Ruggedized handheld computer with imbedded GPS, laser range finder, and MBITR radio with the ability to process lased target as a fire mission for ground, air, and naval surface fires simultaneously or separately and then pass that fire mission digitally to the firing agencies/aircraft.
- Simplified & intuitive Graphical User's Interface to ensure faster response/training.
- Scalable color map display with GPS centering for advanced situational awareness/mission execution/safety planning.
- Integration of Tactical COE client (C2PC) and Joint Multi-User Protocols.
- Develop Precision Fire Control Interoperability in support of Family of Interoperable Pictures (FIOP) architecture & philosophy.

Deliverable Product(s): Software that meets TLDHS acquisition plan Block III requirement.

Milestones:



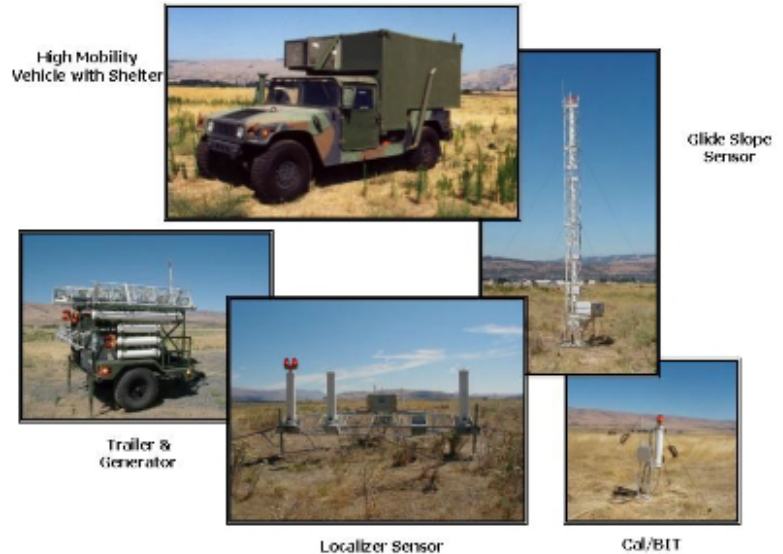
Action Officer: (703) 784-3208

Transportable Transponder Landing System (TTLS)

Purpose: To provide a rapidly deployable (HMMWV mounted or smaller), all weather, precision, non-emitting, terminal air traffic control capability--to be employed under instrument flight rules (IFR) conditions.

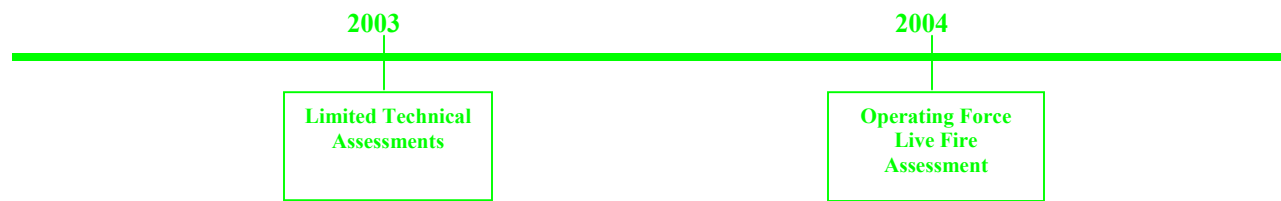
Background: During April 2001, the Marine Air Board identified a requirement for a non-emitting precision approach landing capability. Such a system would be used to provide an initial tactical precision approach capability with reduced footprint and electronic signature. Congress appropriated \$2.25M in FY03 to explore TTLS technology to determine if it has the potential to provide the Marine Corps a portable, low emitting precision approach landing system for aircraft.

Description: TTLS was originally developed under a Defense Advanced Research Projects Agency (DARPA) effort through NAVAIR and Advanced Navigation and Positioning Corp (ANPC). The system was designed to provide a precision approach capability by using inexpensive ground systems to provide position information for aircraft equipped with a transponder and standard Federal Aviation Administration Category I Instrument Landing System (ILS) equipment. In order for TTLS to suit Marine Corps tactical mission requirements, several technologies must be developed. These include: multiple aircraft tracking and guidance; miniaturization of the system for mounting on a supporting ground vehicle; reciprocal approaches/runway support; Local Sector Surveillance & Control; Link 4A data-link guidance output to support Marine aircraft; and reduced susceptibility to jamming. The Lab, in conjunction with NAVAIR, and HQMC, Aviation will assess the ability of ANPC to modify five major features of TTLS: Multiple Aircraft Tracking, 360 Degree Surveillance, Reciprocal Runway Capability, Automatic Carrier Landing System (ACLS), Instrument Carrier Landing System (ICLS) and Joint Precision Approach and Landing System (JPALS) Compatibility, and Miniaturization. Following the assessment, HQMC, Aviation will determine suitability of TTLS for Marine Corps employment and acquisition.



Deliverable Product(s): Assessment reports and requirements documentation.

Milestones:



Action Officer: (703) 784-3208

Advanced First Aid

Purpose: Identify technologies and techniques to reduce the impact of illness or injury on combat effectiveness of individual Marines.

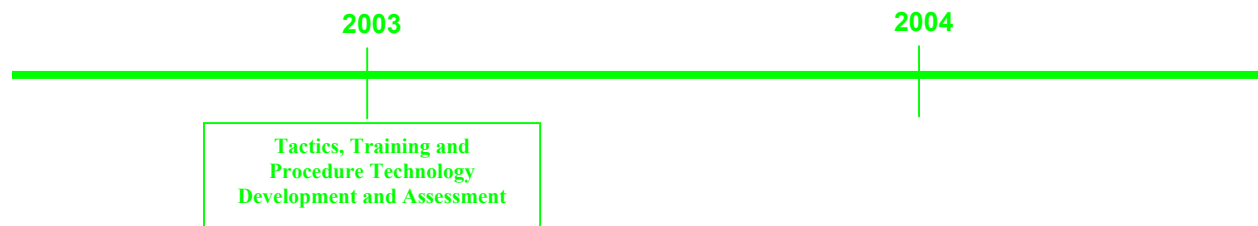
Background: Most combat deaths occur within one half hour of wounding. Also, common injuries if left unattended can cause a Marine to become combat ineffective. Both of these causes of reduced combat capability may be able to be managed by self or buddy aid, which will quickly restore the Marine to effectiveness without the need for evacuation or prolonged convalescence.



Description: This is a grouping of projects intended to validate the Defense Advanced Research Project Agency's (DARPA) efforts in "Combat Persistence". Additionally this effort will provide a transition pathway for products emerging from the technology base, particularly DARPA and other federal and Department of Defense laboratories. The intent is to identify tactics, techniques, procedures and technologies that do not require traditional medical personnel so that individual Marines can increase the first aid they apply to themselves or their squad members. Techniques and technologies developed under this initiative will transition to Marine Corps Systems Command and Chief of Naval Operations. Items will be incorporated into existing Authorized Medical Allowance List (AMAL) reviews or into the individual first aid kit under the Individual Combat Equipment initiative

Deliverable Products: Prototypes and tactics, techniques, and procedures.

Milestones:



Action Officer: (703) 784-3208

Casualty Modeling and Simulation

Purpose: To support analysis into characterizing changes in wounding types and distributions of injuries in asymmetric warfare and MOUT.

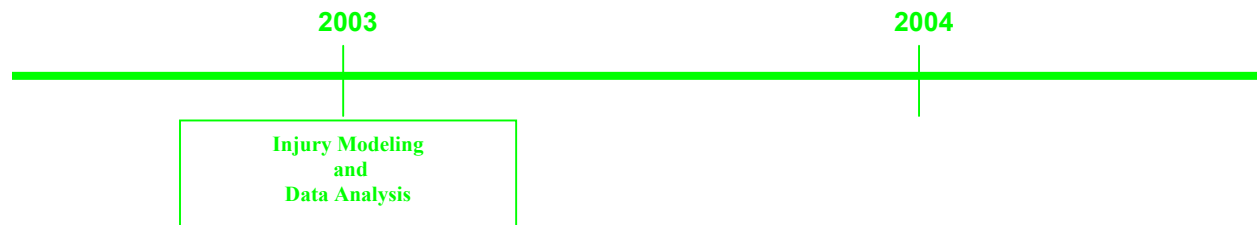
Background: Currently, casualty estimation and distributions of wounds is based on data collected during the Vietnam and Korean conflicts. Changes in body armor, threats and warfighting environments (Urban, etc.) may require adjustment of the historical distributions. Anecdotal evidence supports the hypothesis that future-wounding patterns will be different from the past.



Description: This modeling effort will produce analytical data using injury scoring of contemporary conflict databases. The model will conduct a comparative analysis of historical and contemporary conflicts wounding patterns (US, Russia, Israel, UK, FR, Croatia). The resulting analysis report will support advanced models under development at Naval Health Research Center and SPAWAR.

Deliverable Products: Analysis Report.

Milestones:



Action Officer: (703) 784-3208

Combat Service Support (CSS)

Purpose: In partnership with the operating forces and the CSS Advocate the Sea Viking CSS Team will develop specific innovations intended to yield interim capabilities to enhance a 2004 deploying MEU and provide input to the Expeditionary Force Development System (EFDS).

Background: Combat Service Support units have the same requirements as combat arms units to provide command and control to their mobile CSS detachments (MCSSD), but currently do not have the maneuver, intelligence and fires C2 systems tools. This capability deficiency is even more noticeable in STOM where CSS units are maneuvering on a non-linear battlespace over long distances without supporting friendly units. TTPs and a functional organizational structure that will be required for mobile CSS detachments to operate in a STOM environment will need to be defined. Additionally, there is a need to develop supporting TTPs as advanced CSS C2 (Common Logistics Command and Control System (CLC2S) systems are introduced to the operating forces.



Description: This initiative will develop training programs of instruction, standard operating procedures and staff tactics, techniques and procedures needed to employ and command and control mobile combat service support detachments supporting a STOM operation. In addition, this effort will develop TTPs for combat service support requests using advanced digital systems.

- Interim Enhancements
 - CSS C2 suite that supports STOM.
 - MCSSD concept of employment and task organizations capable of supporting combat forces ashore during a STOM.
 - TTPs and recommended MEU CSS organizational structure to exploit digital logistics and maneuver C2 systems to include processing combat service support requests.
- EFDS
 - Assessment of interim enhancements.
 - Recommendations for follow on versions of CLC2S.

Deliverable Products: CSS C2 suite, TTPs, concept of employment and assessment reports.

Milestones:



Action Officers: (703) 784-1088

Enroute Care

Purpose: To improve the ability to transport unstable casualties from forward operating areas to the sea base.

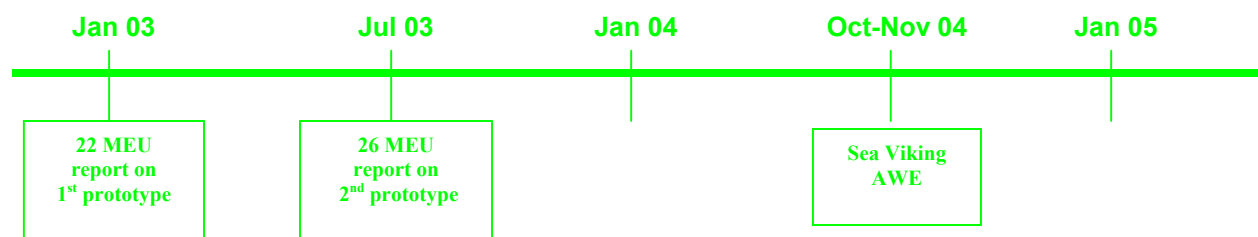
Background: Current Health Service Doctrine provides for maintenance of shore-based elements in order to provide resuscitative care. Following such care, the casualties are held in the shore base until they can be safely transported on opportune lift aircraft. The Enroute care initiative provides personnel and material to rapidly convert opportune transport to attended medical transport platforms and provide supervised medical transport for seriously injured but stabilized casualties. Reducing the time casualties are held on shore will decrease the shore based logistic requirements and improve clinical outcomes.

Description: The Enroute Care initiative provides personnel and equipment to rapidly convert opportune transport to attended medical transport platforms that provide supervised medical transport for seriously injured but stabilized casualties. Reducing the time casualties are held on shore will decrease the shore based logistic requirements and improve clinical outcomes. Concept of experimentation entails prototype development and field user evaluation.



Deliverable Products: Prototypes and assessment reports.

Milestones:



Action Officer: (703) 784-3208

Expeditionary Surface Materials (ESM)

Purpose: The objective of this effort is to develop materials and tactics, techniques and procedures (TTP) for rapidly upgrading, repairing, or constructing expeditionary or contingency airfields in-theater with a low logistics footprint.

Background: Current engineer equipment is bulky, slow, and Marine engineers will have a difficult time adapting to Expeditionary Maneuver Warfare and attempts to minimize footprint ashore. AM-2 matting is the only airfield-suitable surfacing material in the current inventory. A material is needed to augment or replace AM-2 matting as well as provide much needed Foreign Object Damage reduction and soil and dust abatement/stabilization. Such a material would be light, easily employed, inexpensive, and capable of bearing taxiing and parked aircraft as well as heavy ground vehicle traffic. The Director, Logistics Plans, Policies, & Strategic Mobility Division, Installation & Logistics Department, HQMC has requested that the Lab conduct experimentation to identify solutions for the above deficiencies.



Description: The Lab will conduct technology search for commercial-off-the-shelf items and solicit industry for solutions. Technologies will initially be examined through advanced terrain analysis technologies and performance prediction modeling to optimize contingency airfield site selection, exploit advanced construction technologies to enhance airfield construction productivity, and develop emerging soil stabilization technologies to rapidly construct contingency airfields capable of supporting operating force requirements. The engineer community will evaluate and recommend candidate technologies for further experimentation by the Lab. Selected ESM technologies will be assessed and TTPs will be developed.

Deliverable Products: Prototype surface materials and requirement documentation.

Milestones:



Action Officer: (703) 784-1088

Expeditionary Surface Materials (ESM)

Purpose: The objective of this effort is to develop materials and tactics, techniques and procedures (TTP) for rapidly upgrading, repairing, or constructing expeditionary or contingency airfields in-theater with a low logistics footprint.

Background: Current engineer equipment is bulky, slow, and Marine engineers will have a difficult time adapting to Expeditionary Maneuver Warfare and attempts to minimize footprint ashore. AM-2 matting is the only airfield-suitable surfacing material in the current inventory. A material is needed to augment or replace AM-2 matting as well as provide much needed Foreign Object Damage reduction and soil and dust abatement/stabilization. Such a material would be light, easily employed, inexpensive, and capable of bearing taxiing and parked aircraft as well as heavy ground vehicle traffic. The Director, Logistics Plans, Policies, & Strategic Mobility Division, Installation & Logistics Department, HQMC has requested that the Lab conduct experimentation to identify solutions for the above deficiencies.



Description: The Lab will conduct technology search for commercial-off-the-shelf items and solicit industry for solutions. Technologies will initially be examined through advanced terrain analysis technologies and performance prediction modeling to optimize contingency airfield site selection, exploit advanced construction technologies to enhance airfield construction productivity, and develop emerging soil stabilization technologies to rapidly construct contingency airfields capable of supporting operating force requirements. The engineer community will evaluate and recommend candidate technologies for further experimentation by the Lab. Selected ESM technologies will be assessed and TTPs will be developed.

Deliverable Products: Prototype surface materials and requirement documentation.

Milestones:



Action Officer: (703) 784-1088

Forward Area Self Contained Transportable Fluid System (FAST)

Purpose: To assess enhanced packaged fuel capabilities that support operating forces in expeditionary forward operating conditions associated with *Ship to Objective Maneuver (STOM)* operations.

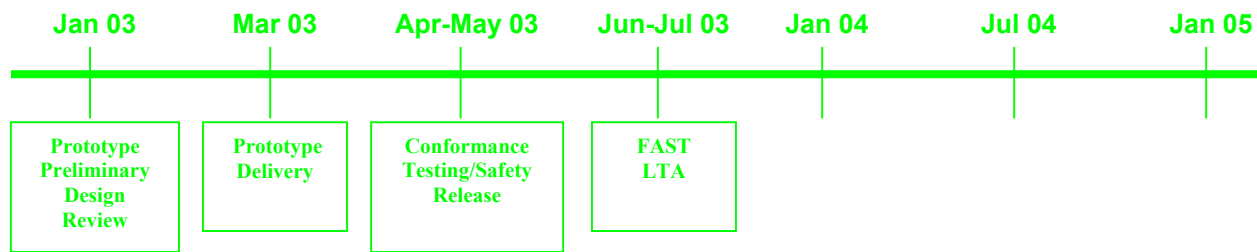
Background: In 1996 the USMC realized the need for supplemental fuel carrying capacity on its' M1A1 Tanks and other armored vehicles. The 55-gallon FLEXCEL met short-term goals but requirements based on STOM and other expeditionary operations require a system without an external pump or pressure requirements.



Description: The FAST system is designed for high portability/transport and can be rapidly deployed and put into service without extensive support equipment or specialized crew. The system is deliberately designed to achieve high reliability and durability to ensure that it will be operational under mission profiles involving extreme operational conditions. There are no special training requirements. Technical objectives consist of optimized design configurations based on transportability, interoperability and employment requirements; high reliability, and durability; safety features, and advanced materials that either eliminate or significantly reduce life cycle costs. Key components of the FAST system are: the Storage Container, Dispensing System, Fittings/Connections and Support Equipment. During FY03 FAST will be assessed in a series of limited technical assessments (LTA) in order to determine the system's capabilities, limitations and "general" military utility for operational employment. These assessments will identify potential system shortcomings that can be identified as "future" upgrades. Each LTA will be conducted in environments that are as operationally realistic as possible with typical Marine operators to obtain a valid estimate of user-equipment interfaces.

Deliverable Products: Prototype system, assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1089

Improved Expedient Fortification Construction (IEFC)

Purpose: Assess commercial-off-the-shelf (COTS) expedient fortification construction systems.

Background: The Marine Corps' current expedient fortification capability is the sandbag, which is manpower intensive and is one-time use. An "easy-to-build, scalable and reusable" force protection structure is needed in the rapidly changing asymmetric environment that our Marines operate. By leveraging modern materials and techniques, we can increase force protection

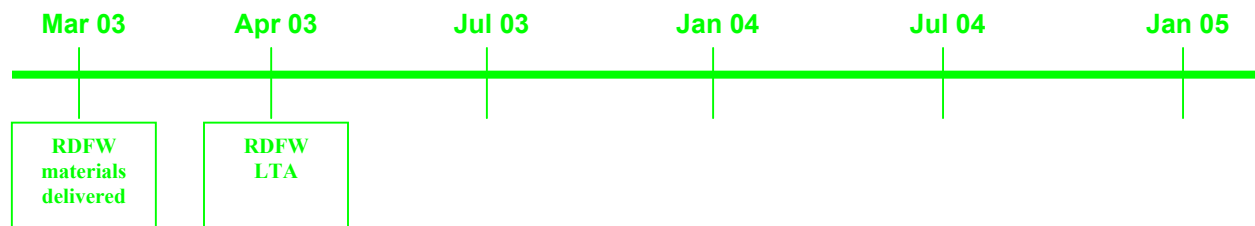


while decreasing the manpower hours needed to construct expedient fortifications. The Director, Logistics Plans, Policies and Strategic Mobility Division at Headquarters Marine Corps Installation and Logistics has asked the Lab to conduct experimentation in the areas of counter mobility and survivability, both of which fall under this initiative. Congressional support has been garnered with funding specifically allocated for experimentation with this innovative technology.

Description: The Rapid Deployment Fortification Wall (RDFW) made by GeoCell Systems Inc., is currently available through the GSA schedule. The material is a reusable, expandable, stackable, modular wall made of tough, lightweight, environmentally responsible plastic, engineered by Eastman Chemical to be used in lieu of sandbags. As a result of recently released congressional funding, this effort will be integrated with the MAGTF Utility Tractor-Tactical (MUTT) assessment being conducted in part at the Marine Corps Engineer School. Assessment will include construction of bunkers, revetments, obstacles, as well as looking into application for runway/roadway crater repair.

Deliverable Products: Prototypes, assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1089

Health Effects of Enhanced Blast (Thermo baric) Munitions

Purpose: Determine the protective effect of body armor against thermo baric weapons and characterize the natural evolution of injury following blast exposure for survivors. Develop means to detect casualties subject to life threatening latent effects

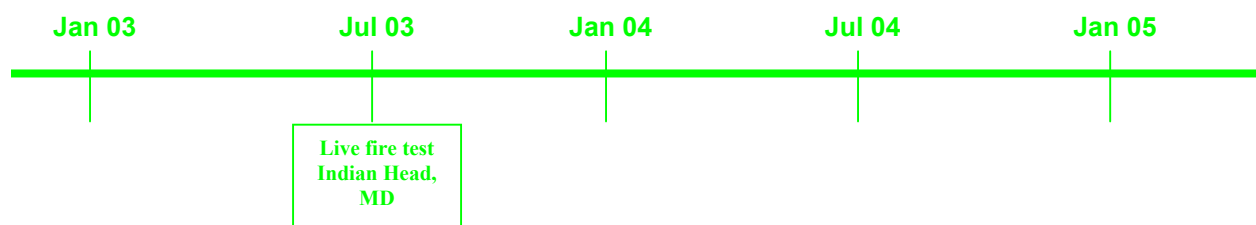
Background: Thermo baric weapons are specifically designed to amplify the blast and thermal energy directed against personnel and structures beyond more conventional high explosive blast weapons. The effects are even more pronounced when employed within confined spaces. Evidence indicates these weapons have a greater potential to more severely injure the brain and nervous system when compared to more conventional high explosives. This suggests a different injury mechanism exists for these weapons. Injury mechanisms resulting from thermo baric weapons have not been previously studied and no information is available in the medical literature describing the injuries produced by these weapons. Past studies and field experience indicates that soft body armor may in fact exacerbate primary blast injuries, though the exact reasons are a matter of debate. These findings may seem confusing and call the effectiveness of the armor into question. Testing is required to establish whether primary blast injury from thermo baric weapons is made worse by wearing body armor, and to what degree. Even if primary blast injury is made worse, the threat from casing fragments, secondary projectiles, and small arms fire may remain the overwhelming risk. To further complicate the question of armor effectiveness, studies also indicate that armor systems with ceramic or metal ballistic plates may not exacerbate primary blast injury, but rather, due to the increased acoustic impedance of these systems, they may provide superior blast protection when compared to no armor or soft armor alone. Delayed effects of thermo baric weapons exposure can appear days after exposure and can lead to death. Injury can occur with no easily recognizable visible signs. Early detection and proper treatment is essential to avoid latent manifestations of injury. Of particular importance are the early indicators of exposure.



Description: The Lab is supporting a Marine Corps Systems Command effort to determine the effects of thermo baric weapons so they can be prioritized against the risks from fragmenting weapons and small arms fire and a general policy on armor use can be developed. Additionally, the Lab will assess materials and methods to mitigate blast injury caused by these weapons.

Deliverable Products: Assessment reports and tactics, techniques and procedures.

Milestones:



Action Officer: (703) 784-3208

High Speed Vessel

Purpose: Assess the utility of commercially available High Speed Vessels (HSV) to provide high speed, long range, and high-volume surface lift capabilities.

Background: This is a Joint initiative. The Marine Corps Combat Development Command (MCCDC), the Navy Warfare Development Command (NWDC), and the United States Army Combined Arms Support Command (CASCOM), in conjunction with commercial industry, are cooperating in this effort. The Marine Corps goals are to explore the ability and compatibility of commercially available HSV with advanced hull, propulsion, and communications technology to support seabased operations.

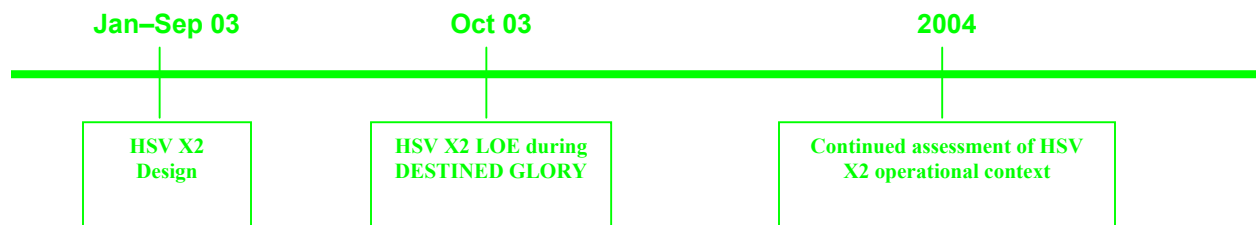


Description: The Joint Venture (HSV-X1) is a 96-meter, 45 knot, dual hull, shallow draft, commercial catamaran that has been modified to meet military experimentation requirements for rotary wing aircraft, roll-on/roll-off vehicles, small boats, and a state-of-the art command and control system. The INCAT TASMANIA PTY LTD shipbuilding company designed the HSV-X1 in Australia. Prior to joint military experimentation with the Army, Navy and Marine Corps, the vessel underwent six weeks of structural enhancements to install a certified flight deck to support SH-60/CH-46 helicopters, a starboard-aft quartering ramp to allow rapid loading/offloading of ground tactical vehicles, an overhanging crane system to launch/recover small boats, and a robust C2 suite.

Experimentation during FY 03 has been put on hold as the Joint Venture has been deployed in support of on-going real world operations. Focus is now on design of HSV X2 as it is being built in the yard in Australia. The schedule for X2 is still being worked. Currently, the first USMC experimentation with X2 will take place during DESTINED GLORY scheduled for October of 2003. During FY04 planned experimentation will include use of X2 in MPF/JLOTS and causeway exercises. Further experimentation will examine operational maneuver, including conduct of raids, sustainment, ARG support, and HA/DR.

Deliverable Products: Experimental design for Marine Corps limited objective experiments (LOE), assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1089

Purpose: To assess lightweight water purification systems.

Background: The Office of Naval Research (ONR) is developing improved water production capabilities for the Marine Corps. Their Lightweight Water Purifier (LWP) project originated with the idea to simplify the new, but existing Army LWP design, reduce the overall system weight and footprint/cube, and make the LWP

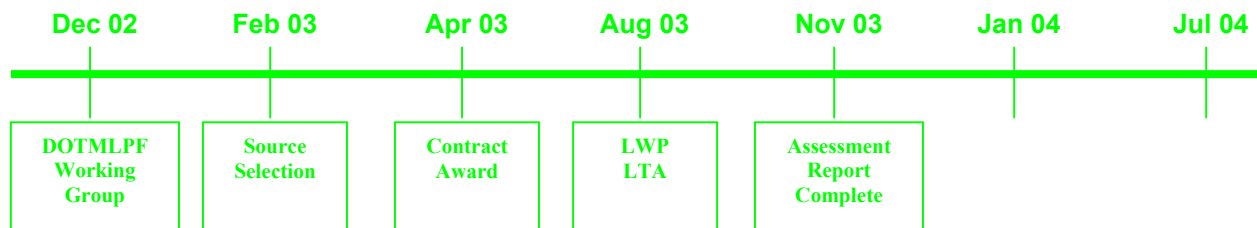


easier to troubleshoot and maintain by field personnel. The current Army design, using a micro filtration pretreatment system, produces excellent quality feed water for the RO system from virtually any natural feed water source, but increased the level of complexity from a troubleshooting and operator interface standpoint. The assessment goal is to identify specific Marine Corps requirements and capabilities not met by the Army LWP and determine if they can be incorporated into a new design. While leveraging the existing Army LWP for Marine Corps use could greatly reduce development time ONR is also investigating commercially available LWP systems that could be used by Marines.

Description: This effort entails performing a market survey of commercially available LWP systems and performing an evaluation of those systems. The evaluation will be set into two phases: the first phase will be conducted by Seawater Desalination Test Facility (SDTF) staff members at NFESC while the second phase will be conducted by the Lab with selected Operational Forces Marines. During the testing phase, data will be gathered to evaluate a system's operational characteristics so a "functional" life cycle cost estimate can be created for each design. In addition, operator opinions will be gathered in a specially formulated questionnaire designed to document exactly what was deemed advantageous and disadvantageous with the various systems.

Deliverable Products: Assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1088

Mine Countermeasures (MCM)

Purpose: To develop a Mine Counter Measures capability set for operational assessment by a deploying Marine Expeditionary Unit (MEU).

Background: The Institute for Defense Analyses (IDA) and the Office of Naval Research (ONR) study *MCM from Beach Exit Zone to Objectives* recommended near to far-term MCM initiatives to ensure that Marine Air-Ground Task Force will be a viable component of Expeditionary Maneuver Warfare. The Commanding General, Marine Corps Warfighting Laboratory (MCWL)/Vice Chief of Naval Research recommended four MCM experimentation evaluations during fiscal years 2003 and 2004.

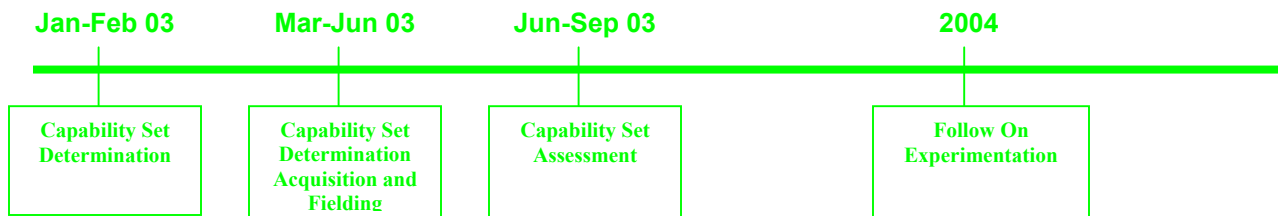
These four evaluations will include: (1) Lightweight full-width mine rollers and mine extractors mounted on Light Armored Vehicles to breach assault lanes and clear mines on combat roads and trails, (2) Hydrema (medium weight) and Keiler (heavy weight) flails to rapidly clear both antipersonnel and antitank mines for laydown/beddown sites and for use in route clearance, (3). Individual protective systems to enhance survivability of dismounted personnel during mine clearance operations, and (4) Hand held detectors experimentation, including the Hand held Standoff Mine Detection System (HSTAMIDS).



Description: The Lab is focusing on the following MCM areas: (1) Development of a Marine Expeditionary Unit (MEU) MCM Capability Set (2) Follow-on experimentation of candidate technologies (3) Coordination with the Office of Naval Research on near- and far-term S&T initiatives. This effort will produce specifications for a MEU MCM Capability Set, tailored and scalable tactics, techniques, procedures (TTPs), and MCM kits for experimentation by I MEF, II MEF, and Marine Corps Combat Engineer School.

Deliverable Products: Prototype capability sets, TTPs, assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1089

MAGTF Utility Tractor Tactical (MUTT)

Purpose: To assist the engineer community/advocate to assess small, multi-use, utility tractors in support of the Marine Air Ground Task Force.

Background: Recent lessons learned from Operation Enduring Freedom included a lack of Material Handling Equipment (MHE) for the purpose of Rapid Runway Repair (RRR)/Airfield Damage Repair (ADR), basic field fortification and rapidly constructed revetments. Candidate MHE solutions for the aforementioned, in support of Expeditionary Maneuver Warfare, must be small enough for CH-53E transportability, yet durable and rated with an operating capacity to support Forward Operating Bases during contingency operations.



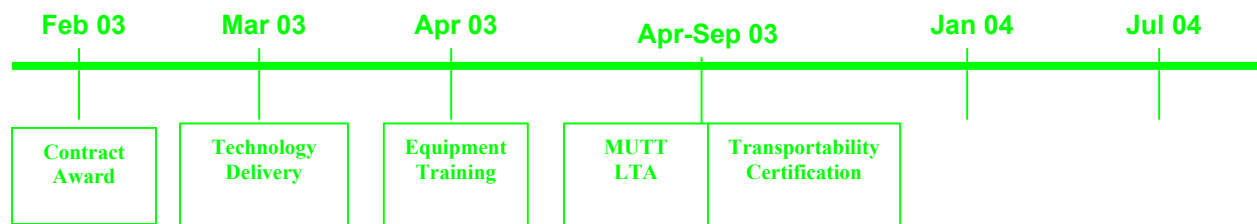
Description: Bobcat front-end and compact track loaders exist on GSA schedules for procurement, yet tactics, techniques, and procedures (TTP's) as applied to 21st century warfighting concepts are needed for their operational employment. The Lab will provide the following MUTT variants for operational experimentation by Marine operating forces:

- Bobcat A220 All-wheel Steer and Bobcat T200 Compact Track Loaders
- Attachments to include: auger, backhoe, 4-in-1 combination bucket, wheel saw, pallet forks (hydraulic), breaker, angle broom, vibratory roller. Attachments are interchangeable between loader types.

Marine Wing Support Group-37 will assist in the development of TTPs and conduct the ADR/RRR assessment. Second Combat Engineer Battalion will assist in the development of TTPs and conduct the field fortification/revetment construction assessment. The Marine Corps Engineer School will assist in the development of all associated TTPs and provide input as to fielding and technology management. The Lab will provide overall assessment supervision and, through the US Army Tank Automotive Command, acquire the necessary transportability certification for this technology for rail, highway, marine, and air systems.

Deliverable Products: Assessment reports and refined and validated requirement documentation for future loader acquisition.

Milestones:

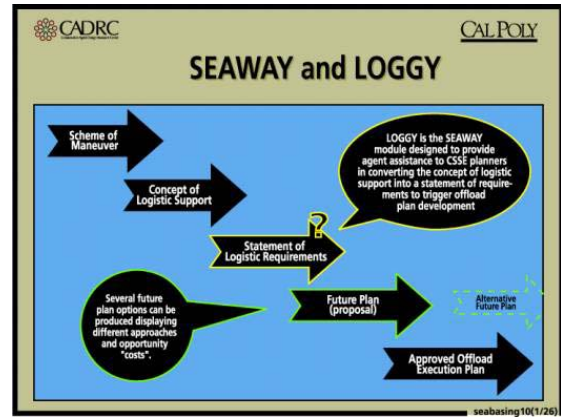


Action Officer: (703) 784-1089

SEAWAY/LOGGY Version 2.0

Purpose: Provide an adaptive tool for translating courses of action into statements of logistics requirements and Combat Service Support offload plans for use in wargaming and concept assessment.

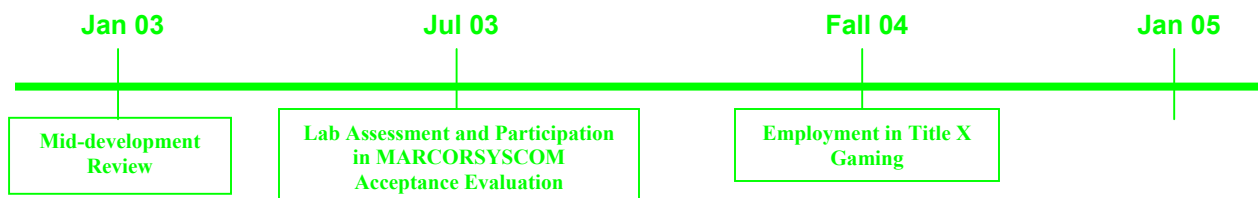
Background: To transition from *seminar wargaming* to computer assisted *analytic wargaming* requires tools to bring precision to discussion of future concepts. This specifically includes feasibility of seabased EMW/STOM concepts in order to identify the assets and quantities required for operational frames. Additionally, SEAWAY/LOGGY provides an adaptive C2 capability to execute the logistic planning, monitoring, and continuous in-stride re-planning vital to successfully executing sea based sustainment.



Description: SEAWAY/LOGGY is a prototype adaptive logistic C2 system developed under ONR/MARCORSYSCOM with specific wargaming and assessment features for the Lab and Wargaming Division. It employs intelligent agent technology to manipulate information and data for logistic planning and execution. SEAWAY's software agents assist wargame staffs or capability assessors to develop logistics requirements for given schemes of maneuver, and to assess the risk and feasibility of courses of action. But, unlike most current systems, the creation of an offload plan to support the JTF from the sea base is only the first step. As information is received highlighting changes in the operational, the weather, or the inventory picture, SEAWAY continuously modifies the plan and creates follow-on sequels for staff review. SEAWAY/LOGGY can be artificially stimulated with situational inputs in order to produce alerts, warnings, implications, and option comparisons. Equipped with a gaming interface, SEAWAY offers an integrated synthetic maritime expeditionary environment. It is a near real time operational framework in which weather, operational picture, inventory, and forces can be manipulated individually or collectively at the same time. It is also allows introduction of virtual systems such as a new ship or helicopter to assess impact and value.

Deliverable Products: Version 2.0 software for continued use as a wargaming and concept assessment tool.

Milestones:



Action Officer: (703) 784-6881

Tactical Medical Coordination System (TacMedCS)

Purpose: Support Marine Corps Systems Command and the Navy Medical Department to develop a prototype system to enhance casualty evacuation via an *individual casualty locator* and provide an electronic, redundant patient treatment record retrievable from external locations.

Background: No current system exists to ease locating casualties for evacuation and to provide treatment record redundancy. The relevant operation requirements document 95334D-E07 and the JV2010 *En route Care Seminar* indicated that this capability is needed to support emerging concepts.

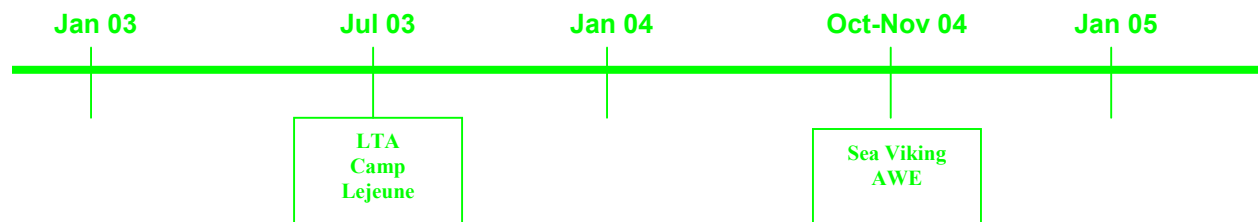
Description: Conceptually, the Tactical Medical Coordination System is like *FEDEX for casualties*. The concept is based on a radio frequency tag worn by an individual that acts as a digital treatment record. This system differs from SMARTCARD and other alternative approaches to digital medical information.



TacMedCS is appealing because it is an RF based system, which doesn't require contact with the device to be able to read and write data. There is no need to remove clothing or protective gear. The tag has been tested through MOPP gear, Kevlar, body armor, and various other forms of military clothing. The tag is passive. It transmits nothing until it is interrogated.

Deliverable Products: Universal Needs Statement, prototype hand-held concept demonstrator, and assessment reports.

Milestones:

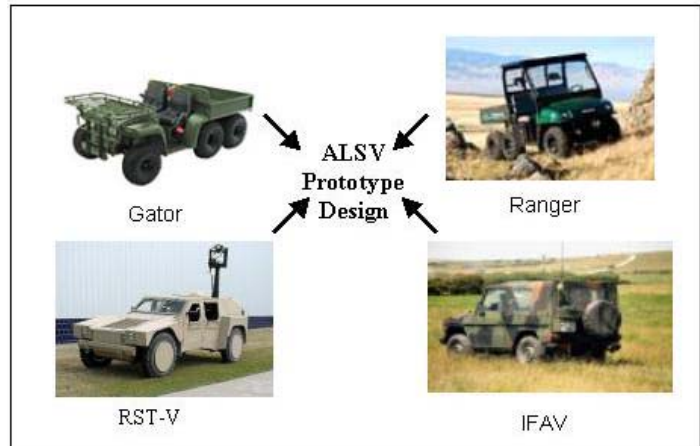


Action Officer: (703) 784-3208

Advanced Light Strike Vehicle (ALSV)

Purpose: Using the most advanced prototyping tools available this effort will produce a *paper design* of an Advanced Light Strike Vehicle. Once the paper design is approved by the Ground Combat Element Advocate the Lab in conjunction with industry will build a working prototype and assess its performance in a wide range of environments and mission scenarios.

Background: The Marine Corps has a requirement for a motorized offensive strike platform transportable in the MV22 tilt-rotor aircraft. The driving design factor and greatest design challenge for the ALSV is the key performance parameter of internal transport in the MV22. Mission effective and mission suitable production vehicles (Commercial Off-the Shelf) transportable by the MV22 do not exist.



Description: An integrated product team comprised of Marine Corps operational subject matter experts, Navy vehicle and aircraft designers, and industry representatives will be formed to develop an ALSV design. The design phase will incorporate proprietary technologies, independent research and development, and emerging technologies to design a working prototype ALSV. Additionally, this team will leverage all lessons learned from past vehicle design efforts, and efforts to adapt commercial vehicles to internal transport aboard MV22s. The combination of technical expertise, extensive vehicle design tools, and state-of-the-art prototyping processes are expected to provide substantial cost avoidance and shortened development time. Once the Advocate approves the *paper design* construction of a working prototype will begin. The prototype vehicle will then undergo assessment in a variety of environments and mission scenarios.

Deliverable Product(s): Paper Design and Prototype ALSV

Milestones:



Action Officer: (703) 784-3425

Alternate Power Source

Purpose: Develop an alternate power source for the family of man-packable tactical radios used by Marine operating forces.

Background: The single greatest limiting factor in the mobility and field operating time for reconnaissance units is the weight and service life of current power sources for radios and Reconnaissance, Surveillance, and Target Acquisition technologies. Alternatives are needed that are lightweight, quiet and affordable. The objective is to reduce the Marine's combat load and battery requirement by developing a power source that is lighter than and yields or exceeds the power densities of the current battery technology (BA-5590). This initiative supports the Alternate Power Mission Need Statement.



Description: Zinc-air batteries use oxygen from the atmosphere to react electrochemically with alkaline zinc anodes similar to those found in alkaline batteries (e.g. Duracell, Energizer), making them very lightweight, safe, and low cost. The air is drawn into the battery case and circulated through it via a small direct current fan powered by the battery, so that full power is achieved even when the battery is packed into a rucksack. Since the zinc-air battery is larger than a BA-5590 battery, there is an electrical interface the size of the BA-5590, which fits into the battery compartment of the radio-transmitter, and this is connected to the zinc-air battery via a retractile cord. Connection of the cord to the zinc-air battery energizes the fan. The model FC zinc-air battery weighs 5.5 lbs, versus 2.2 lbs. for the BA-5590, but delivers the equivalent capacity of 6 BA-5590's, powering an AN/PRC-119B or AN/PRC-119F for six to nine days depending on usage. Once in production it will deliver electrical power at a cost of about 15-20 cents per watt-hour, versus 42 cents per watt-hour for the BA-5590. The Marine Corps Warfighting Laboratory in conjunction with the Army's CECOM's Fuel Cell Technology Team, Fort Monmouth, NJ, will evaluate the Zinc-Air fuel cells, assess and document fuel cell performance (technological maturity, size, weight, and cost) in comparison to current SINCGARS battery and other candidate power source technologies, and deliver a prototype fuel cell power source for field experimentation.

Deliverable Product(s): Prototype Zinc-Air fuel cell power source and assessment that shows advantages over current SINCGARS battery technology in size, weight, and cost.

Milestones:



Action Officer: (703) 784-0056

Automatic Lightweight Grenade Launcher (ALGL)

Purpose: Provide enhanced firepower for infantry with greater lethality and minimized logistical burden than current crew-served grenade launcher systems.

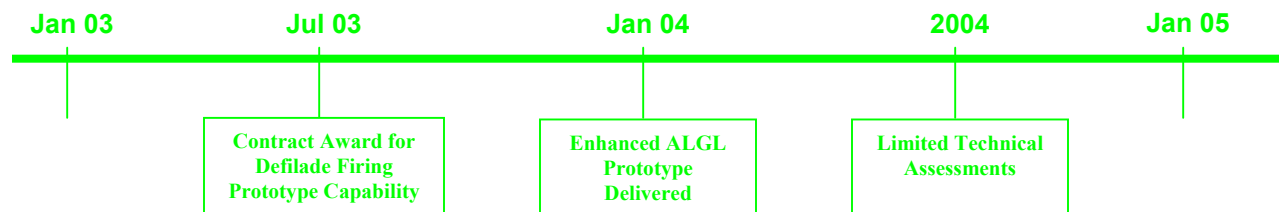
Background: The Lab began experimentation with ALGL on behalf of the Marine Corps Systems Command' Ground Weapons Program Manager to assist in providing operational assessment by the operating forces.

Description: The ALGL is a prototype 40-mm grenade machine gun that is a lightweight, low-recoil weapon with ammunition that can be programmed for airbursts. It is outfitted with a computer processor and laser range finder that provides a fire solution. Marines will use this system in all operational environments. The Lab is partnering with the Office of Naval Research to develop and enhanced indirect/defilade-firing capability for the ALGL.



Deliverable Product(s): Prototype, assessment report, and requirement documentation.

Milestones:



Action Officer: (703) 784-3425

Combat Decision Range

Purpose: Provide a portable training tool to the operating forces to exercise and develop small unit leaders' tactical decision-making and situation recognition skills.

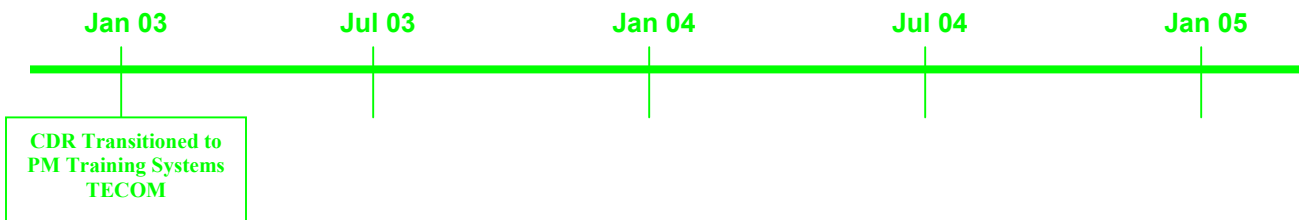
Background: Experience saves lives. The Combat Decision Range (CDR) uses facilitated, multimedia-driven combat scenarios to build artificial experience. In a typical 45-minute training session, the Marine makes more tactical decisions than in a week in the field. The CDR is a rifle range for the mind. The CDR is an outgrowth of the Marine Corps' Dynamic Decision-Making study of how selected non-military organizations deal with decision-making problems in their own environments. It is based on a tool used by the Fire Department of New York to train and assess new Battalion Commanders in the kinds of decisions required in fighting each of the basic types of urban fire situations.



Description: The CDR is published in scenarios, distributed on CD ROM, and run on a personal computer by a Marine facilitator, typically from the trainee's own unit. Each scenario puts the trainee in the role of unit leader in a combat environment, gives him a mission, and calls for him to execute it through an evolving situation painted for him in multimedia. Twenty-five scenarios have been developed covering a range of combat situations, with another five in production. The initial CDR scenarios were deployed as part of the Lab's Combat Squad Leader's Course developed for Urban Warrior. The CDR has been further exposed to the operating forces through the infantry regimental training centers and other units. It is highly acclaimed by participants as a stressful, fun, challenging, and very beneficial training tool. The CDR will transition to Training and Education Command (TECOM) in January 2003 and TECOM will continue to develop it within its Training Systems Program Management Office as a solution to requirements for Tactical Decision Making Simulations.

Deliverable Product(s): Updated versions of the CDR software.

Milestones:



Action Officer: (703) 784-6886

Combat Identification & Situational Awareness (CID/SA) for Dismounted Combatants

Purpose: Evaluate systems that provide the dismounted Marine the ability to actively query unknown persons and receive a response from a similarly equipped combatant and/or systems that provide awareness of the location of other Marines.

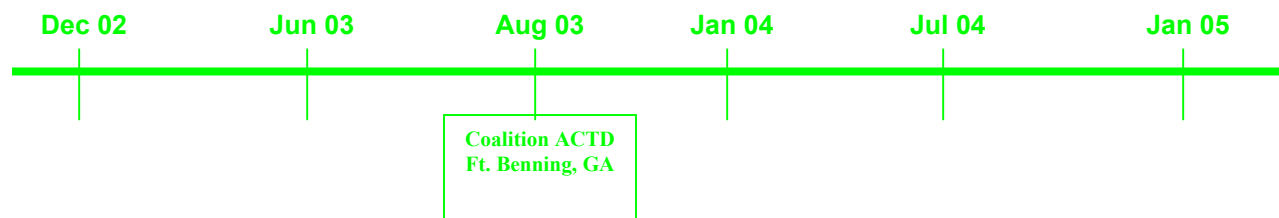
Background: Identification and location awareness of friendly dismounted combatants is an area of particular concern, especially in the urban battlespace, our most likely area of future operations. Current capability consists of a rifle-mounted system based on a laser request and radio frequency return, with Global Positioning System (GPS) based centralized tracking system.

Description: A rifle-mounted laser illuminator and display system. The laser is used to query the unknown person and the display indicates if a friendly response is received. Laser sensors are mounted on the helmet and a web harness system. The sensors signal the main controller to generate a response signal when a friendly laser is detected. The main controller also provides a location signal to a central monitoring computer. Location is based on a GPS receiver mounted on the web system. The central monitoring computer can overlay team locations on a two-dimensional map of the operation area. Boeing Corp. has delivered one squad's worth of systems for experimentation. These units have been temporarily loaned to the U.S. Army's Dismounted Battlespace Battlelab for training. Motorola Corp. has developed a similar system for the U.S. Army, and the Lab received thirteen systems for experimentation undergoing limited technical assessments (LTAs) and examination during Millennium Dragon 2002.



Deliverable Product(s): Universal Needs Statement (UNS) to Marine Corps Combat Development Command and refinement of Combat Identification Mission Needs Statement. Also, prototype equipment to Marine Corps System Command's Combat Identification Program Office.

Milestones:



Action Officer: (703) 784-3425

Defense against Thermobaric Weapons

Purpose: To use the Project Albert array of distillation models and data farming techniques in an attempt to improve techniques, tactics, and procedures for defense against thermobaric weapons in an urban combat environment.

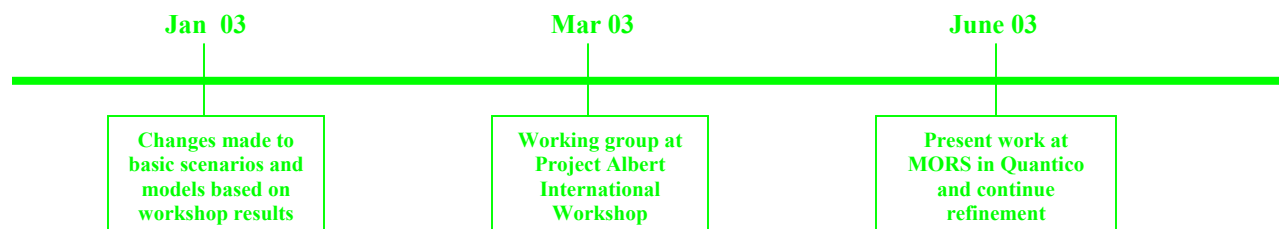
Background: Thermobaric (heat and pressure) weapons were first developed by Russia in the late 1970's. Such weapons contain an explosive warhead that explodes with an intense fireball and over-pressure shockwave. The thermobaric warhead can be delivered by aircraft, artillery, or as a hand held infantry weapon. As demonstrated in the second battle of Chechnya, the thermobaric weapon gives infantry units, even rebel units that may be minimally trained, a weapon that is quite capable of killing enemy forces in close quarters or exposed in trenches more effectively than using standard direct or indirect fires. Project Albert, working in concert with the Marine Corps Warfighting Laboratory's Center for Emerging Threats and Opportunities (CETO), is developing those means to minimize this threat and accomplish the above stated purpose.



Description: Project Albert will conduct a series of workshops in collaboration with other US defense agencies and allied countries. Utilizing a basic defensive scenario developed by CETO, Project Albert will employ current technology for agent-based simulations and try to replicate human interaction and reaction in varying levels of tactical defensive operations in urban combat. With available computing capabilities, Project Albert intends to visually represent the degrees of lethality of weapons, defensive tactics, techniques, procedures and human characteristics. On advice and recommendations from CETO, a determination will be made whether or not the Project Albert array of distillation models can be a relevant capability in answering the above stated purpose.

Deliverable Products: Deliverables include recommendations on the viability of Project Albert tools in supporting the development of defensive tactics, techniques and procedures and technologies in the area of thermobaric weapons and, if viable, a plan to work on providing DOTMLPF recommendations.

Milestones:



Action Officer: (703) 784-1086

Dragon Eye Unmanned Aerial Vehicle (UAV)

Purpose: The Dragon Eye (DE) UAV, a combined project of the Marine Corps Warfighting Laboratory (MCWL), and the Marine Corps Systems Command (MCSC), is a backpackable system with interchangeable modular payloads, designed to provide the small unit leader an over-the-hill reconnaissance capability.

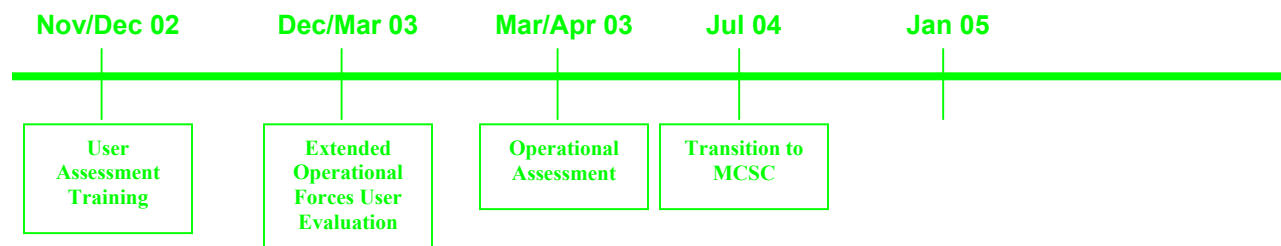
Background: The impetus for the project came from the Secretary of the Navy's Over-the-Hill Reconnaissance initiative, and the Interim Small Unit Remote Scouting System requirement. This UAV is intended to support Marine Corps Systems Command (MCSC) to develop a prototype lightweight, backpackable UAV capable of providing real time day/night video imagery. The MCSC, Program Manager Scouting Systems is the office of record and the Interim Small Unit Remote Sensor System (ISURSS) is a sub-requirement of the Tactical Remote Sensor Suite Operational Requirements Document (ORD).



Description: Dragon Eye is a 4.5-pound, battery-powered, modular UAV capable of fully autonomous flight. Made of lightweight Kevlar material, this system is designed to disassemble into five separate pieces, and carried in an individual Marine's ALICE pack. Missions are programmed via a wireless modem that is integrated into a ten-pound ground control station. After being hand launched, DE flies to pre-assigned GPS waypoints via an onboard autopilot, which has the ability to be reprogrammed in flight. Its sensors include full motion color, low light black and white, and infrared cameras, each having the capability to transmit a video line of sight to a range of ten kilometers. Dragon Eye flies up to speeds of 45 knots, and has a battery endurance of 60 minutes. Ten Dragon Eye prototypes will be provided to I MEF for evaluation, and tactics, techniques and procedures development. Data gathered from this operational assessment will be used to update the ORD and system specifications prior to the production request for proposal release.

Deliverable Product(s): Prototypes and assessment based on operational experimentation.

Milestones:



Action Officer: (703) 784-3208

Dragon Fire II Expeditionary Fires Technology Demonstrator

Purpose: Provide a concept demonstrator of an expeditionary fire support system (EFSS) that has the potential to be as mobile as the ground forces it supports as stipulated in the Expeditionary Fire Support System (EFSS) Mission Need Statement (MNS).

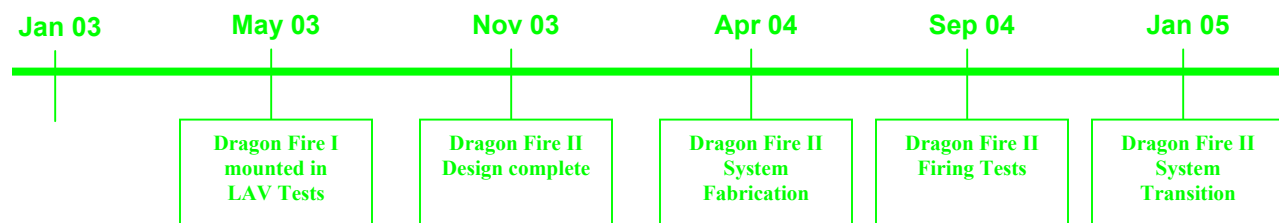
Background: In 1997, the Warfighting Lab developed and experimented with the Dragon Fire, an indirect fire concept demonstrator. Since then, MCCDC has published the EFSS MNS for a light, mobile fire support system configured to support the requirements of Expedition Maneuver Warfare (EMW). The Dragon Fire II is the next generation system, which will incorporate all of the “lessons learned” from the first Dragon Fire experiments to make this system an advanced technology candidate for the EFSS requirement. In addition, the Dragon Fire II is being designed to satisfy the Expeditionary Fire Support Platform (EFSP) requirement to provide effective fires from a Light Armored Vehicle (LAV).



Description: A compact, automated 120mm rifled mortar that can be readily deployed from amphibious shipping either internally within a MV-22 or CH-53, towed by a HMMWV or LAV, or internally loaded and fired from a LAV. The Dragon Fire II can be emplaced and displaced rapidly, has configuration options and on-board communications, navigation and fire control. It is a rifled, recoiling mortar that can traverse 6400 mils and is self-loading. EFTD V2 has a range of 8,200M (13,000M with rocket assisted projectile) and a rate of fire of 10 rounds/min for 2 minutes and 4 rounds/min sustained. It has on-board digital communications and will be capable of full sensor-to-shooter (and remote) operation. This system specifically is designed to provide a concept demonstrator for the EFSS MNS. Development of the LAV mounted configuration of this system will include experiments to develop a fire-on-the-move capability to increase unit agility and responsiveness.

Deliverable Product(s): Prototypes for operational experimentation and requirements documentation.

Milestones:



Action Officer: (703) 784-3425

Dragon Runner Unmanned Vehicle

Purpose: To improve a small unit's situational awareness and force protection by extending their limit observation through the use of mobile ground sensors.

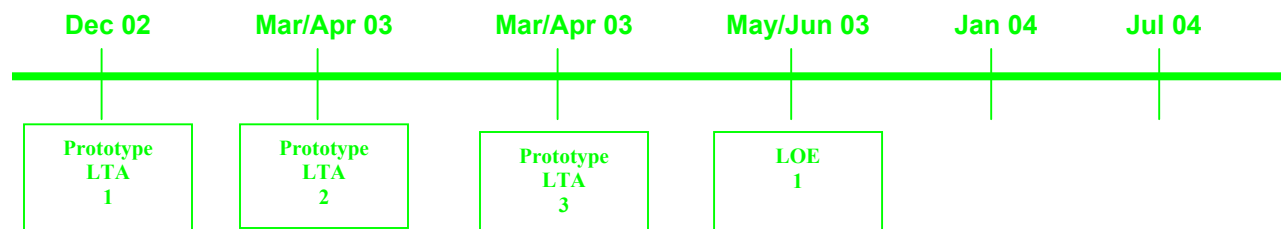
Background: Small units have always relied on their own eyes and ears for tactical reconnaissance surveillance and target acquisition (RSTA) and force protection. In today's battlefields, small unit leaders are increasingly called upon to enter urban or similar complex hostile environments. In such environments, tactical units need a small, low-risk, organic capability to rapidly conduct RSTA and small unit force protection. Such a capability will significantly mitigate the high risk to personnel operating in asymmetric environments. The Dragon Runner will be deployed at the small unit level within the ground combat element. It will increase the employing unit's RSTA capability to observe tactical objectives and danger areas beyond the unit's line of sight. Dragon Runner will accomplish this by providing real-time, "around the corner", imagery directly to operational elements at the small unit level given the tactical situation. Dragon Runner also provides a man-portable limited tactical force protection capability while in "Sentry Mode" by increasing the real-time feedback to the small unit leader.



Description: Initial prototype systems are comprised of three components: Vehicle, Operator Control Unit (OCU) and User Interface. Vehicle size: 15.5" L x 11.25" W x 5" H. System weight: 13 lbs goal (9 lbs vehicle, 4 lbs OCU / User Interface). Each vehicle features a sensor suite, an infrared LED for night use, and a non-active suspension as Dragon Runner will be tossable (through windows, up stairs, over walls, etc.) The OCU is sized to fit within the standard MOLLE SAW ammo pouch and the attached user interface is the size of a standard 5590 battery and features a 4" video display and home-gaming type controller for vehicle control. The entire system fits within the standard MOLLE Patrol Pack and uses 5590 type batteries for power supply.

Deliverable Product(s): Prototypes and assessment based on operational experimentation.

Milestones:



Action Officer: (703) 784-0056

Dragon Warrior Unmanned Aerial Vehicle (UAV)

Purpose: This effort will develop a fully autonomous, HMMWV-transportable, small UAV system for reconnaissance, surveillance, target acquisition (RSTA), and communication relay missions. The Dragon Warrior (DW) will be employed as a Regimental or MEU level asset, have complete shipboard compatibility, and require minimal maintenance and time to train.

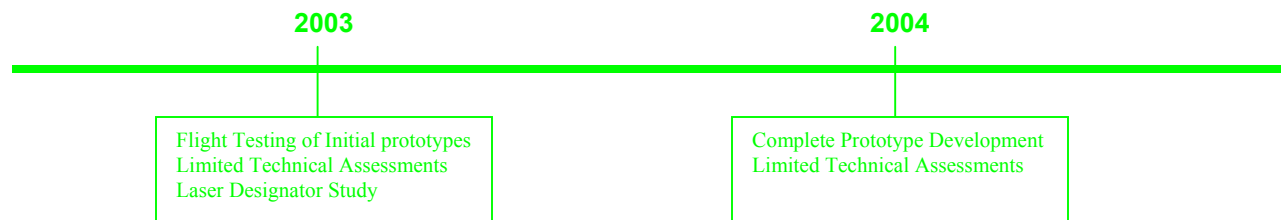
Background: *Hunter Warrior* and *Urban Warrior* experimentation highlighted the need for a more capable UAV for use on the extended battlefield. Use as an in extremis communications relay permits the force commander to place a relay over the battlefield when intervening obstacles interrupt line of sight communications. In addition, the value of a ubiquitous RSTA platform for a variety of sensors that can provide real time data from the battlefield is essential to our emerging concepts of *Expeditionary Maneuver Warfare* and *Ship-to-Objective Maneuver* by providing an additional node on the emerging Naval and Joint sensor networks. This initiative is a technology candidate for the Close Range UAV Requirement.



Description: A fully autonomous vehicle being developed by the Lab and the Naval Research Lab. Current specifications call for the UAV to have a fuselage of approximately 7 feet and a rotor of approximately 8 feet in length. This UAV is being designed to have a maximum speed of 110 knots, a range of 50 nautical miles (maximum range of video down link) with one hour loiter ability. Endurance will be 3-5 hours based on the mission profile. It will be shipboard compatible and employ a heavy fuel engine. The UAV will have a maximum gross weight of 300 lbs. Payload weights will vary between 25 and 35 pounds depending on the mission profile. It will be equipped initially with an EO/IR sensor with laser range finder, with future upgrades to a laser designator. The flight profile is intended to operate fully autonomously; while payloads are controlled via a High Mobility Multipurpose Wheeled Vehicle (HMMWV) mounted Ground Control Station. The entire system, aircraft and data link hardware will fit into a single HMMWV.

Deliverable Product(s): Prototypes and assessment based on operational experimentation.

Milestones:

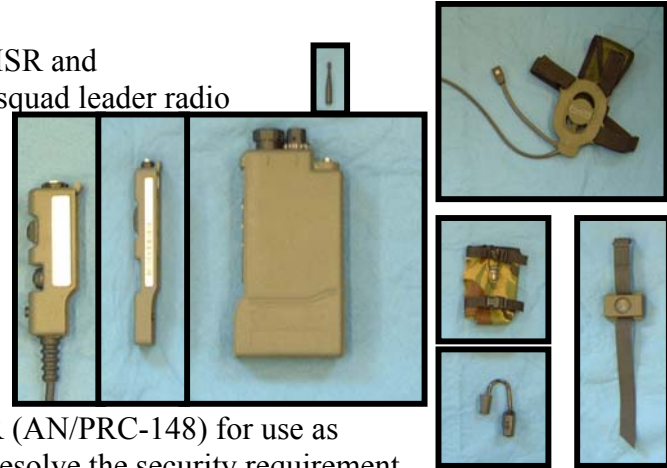


Action Officer: (703) 784-3208

Integrated Intra Squad Radio (ISR)

Purpose: Provide the squad leader an integrated radio that provides the capability for unsecure communications down to the fire teams and secure communications between the squad leaders and up to the platoon commander.

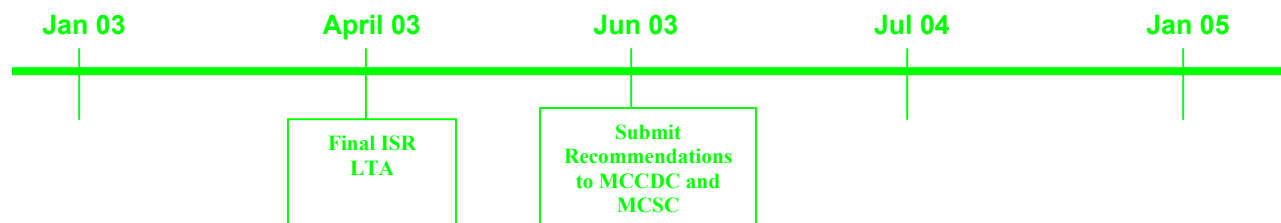
Background: Operational experimentation of the current ISR and Tactical Hand Held Radio (THHR) validated the need for squad leader radio communications to the platoon commander and fire team leader. However, experimentation has revealed that the squad leader will need to be able to receive simultaneous transmissions through the use of a single headset. This leads to the need for a single, integrated squad leader radio that enables communications higher to the platoon commander and lower to the fire team leader. The radio also needs to provide for secure communications between the platoon and squad. The eventual fielding of the THHR (AN/PRC-148) for use as a Type I secure platoon radio to every rifle company will resolve the security requirement, however there is still a need to integrate the Intra Platoon Radio with the ISR for intra squad communications.



Description: The Lab's prototype radio for this effort is the Personal Role Radio (PRR) system. The PRR as is a lightweight radio (less than 550 grams including batteries and ancillaries). The Headset connects into the top of the combined radio pack and has a boom microphone with an NBC respirator adaptor. The Wireless PTT enables the user to transmit without removing their hands from their weapon. The PRR uses Quadrature Phase Shift Keying (QPSK) modulation and spread spectrum techniques and operates in the 2.4 GHz ISM band and provides 256 channels (in 16 groups of 16 channels) in the available bandwidth. Direct sequence spread spectrum signals are inherently noise like and consequently their presence is also difficult to detect. The low transmit power at 2.4 GHz ensures the required range whilst maintaining minimal power consumption minimizing the probability of detection. Low Probability of Detection (LPD) and Low Probability of Intercept (LPI) are inherent to the design of the PRR. Operational experimentation of the PRR by I MEF during 2002 resulted in a Universal Needs Statement (UNS) to replace the current squad radio. The UNS has been signed by the 1st MARDIV Commanding General and has been forwarded to IMEF for approval.

Deliverable Product(s): Recommended material solution and requirement documentation.

Milestones:



Action Officer: (703) 784-1335

Intra Platoon Radio (IPR)

Purpose: Provide secure communications between the Platoon Commander and Squad Leaders.

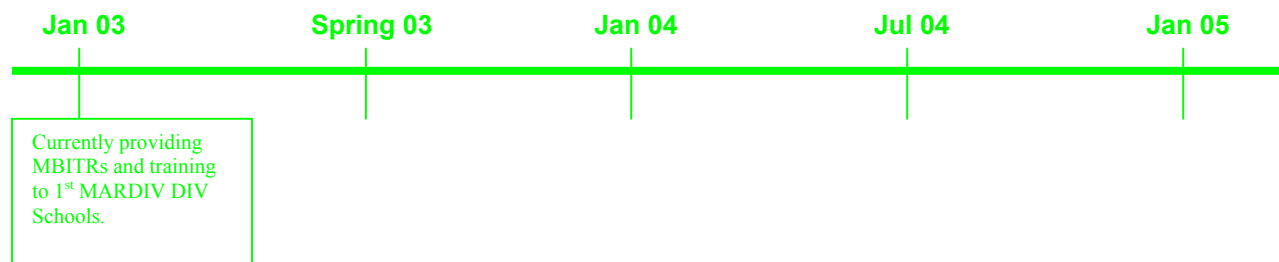
Background: Operational units expanded the employment of the Intra Squad Radio (ISR) as a stopgap measure to provide non-secure communications between the platoon commander and squad leaders. However, during experimentation and assessments in pre-deployment training, operating units identified deficiencies in using a “non-secure” ISR as the platoon tactical radio. During *Urban Warrior*, *Project Metropolis* and *Tactical Warrior* experimentation the requirement for a dependable, secure communication means between platoon commander and squad leaders was repeatedly identified. The requirement is for a secure (Type 1 encrypted) handheld VHF radio that has the capability to integrate with non-secure ISR and secure Single Channel Ground and Airborne Radio System (SINCGARS). The possibility of UHF access in the same radio would provide a potential added capability to coordinate directly with aircraft. Many current radios could potentially meet the IPR requirement; however, the THALES Multi Band Inter/Intra Team Radio (MBITR) (AN/PRC-148) is already being fielded to reconnaissance units, and was a logical choice since adoption would constitute an expansion of a current acquisition system rather than a new start. Initial estimate of the expanded requirement was 1664 radios at an estimated cost of \$9.5 million. MCWL forwarded an assessment report to CG MCCDC recommending procurement and distribution of (21) AN/PRC-148 radios to all infantry companies. CG MCCDC approved an increase of 1,422 AN/PRC-148 radios to the Tactical Handheld Radio (THR) program which provided 21 AN/PRC-148 radios for use as a platoon tactical radio net.



Description: The Lab will continue to define IPR requirements through *Project Metropolis* and *Tactical Warrior* experimentation. Limited technical assessments will also be conducted to define the requirements/options for integration with the ISR.

Deliverable Product(s): Assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-1335

Land Warrior

Purpose: Assess the Army's Land Warrior program to identify capabilities that could support Marine Corps warfighting needs.

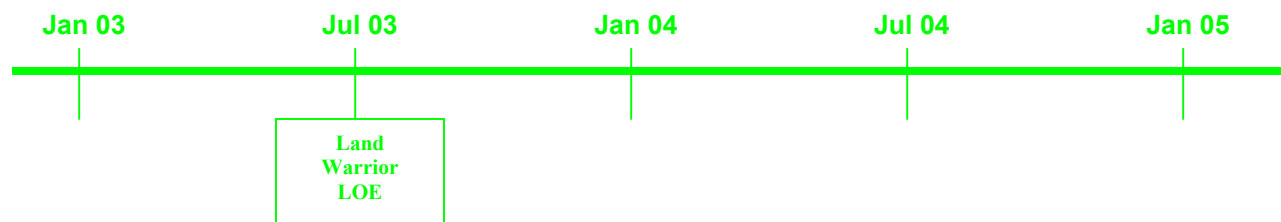
Background: The Land Warrior program is part of the Army's transformation efforts. It entails equipping and instrumenting individual soldiers in an attempt to integrate and digitize the battlefield. As part of the Marine Corps Warfighting Labs ongoing efforts in the areas of Combat I.D., Blue Force PLI and Net-centric warfare it is incumbent on us to maintain situational awareness on the successes and failures of the Land Warrior program and where appropriate, conduct live experimentation with selected components.



Description: The Lab's Land Warrior experimentation will entail training and then employing a Platoon's worth of Land Warrior 1.0 systems utilizing a II MEF infantry platoon and evaluating it under realistic operational conditions. Environments will include both field and urban.

Deliverable Product(s): Assessment Report.

Milestones:



Action Officer: (703) 784-3785

Lightweight Counter-Mortar Radar

Purpose: Assess the U.S. Army Special Operations Command (USASOC) Lightweight Counter-Mortar Radar (LCMR) to determine if this capability could support Marine Corps warfighting needs.

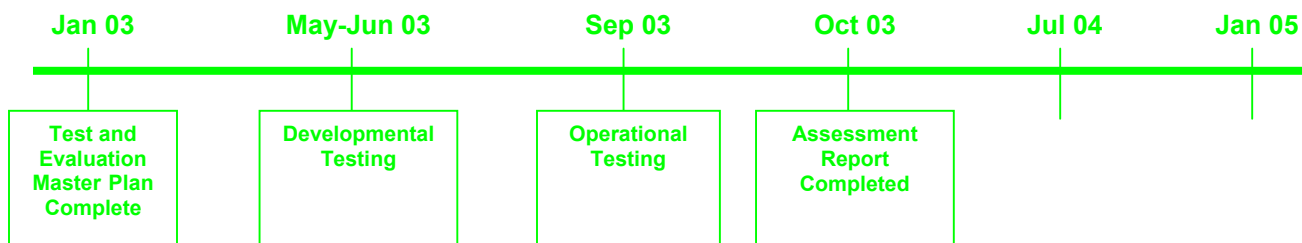
Background: The Army has identified a requirement for a lightweight counter-fire radar capability that can be employed during static line airborne operations. This capability will enable forces such as the 75th Ranger Regiment conducting airfield seizure operations to locate hostile indirect fires systems. This capability may also meet a Marine Corps need for a reduced footprint ashore in support of *Ship to Objective Maneuver* operations.



Description: The LCMR is composed of two 60-pound components that can be employed by two static line jumpers. The system operates autonomously and provides omni-directional detection capability. As an enemy mortar round is detected, the system provides wireless digital transmission to the unit's command and control node. Transmitted data will include a grid coordinate indicating where the round originated. LCMR uses radio frequency technology to locate incoming rounds using a directional or omni-directional feature that can be manipulated to a specific sector of interest. The objective system will be capable of 100M circular probable error at a range of 10 KM. The Lab will monitor the program through operational testing to develop an complete assessment of the LCMR. A decision purchase prototype for Marine Corps experimentation will be made following the assessment.

Deliverable Product(s): Assessment Report.

Milestones:



Action Officer: (703) 784-3785

M3M Machine Gun System, Ground Assessment

Purpose: Examine the effectiveness and suitability of a high rate of fire .50 cal machine gun for support of ground forces.

Background: This project began as an initiative within Project Metropolis in conjunction with assessments of a M3M Air .50 cal Machine Gun. The initial thinking was that a high rate of fire .50 cal (high rate of fire is defined as >800 rounds per minute) would have inherent advantages when used from ground platforms; e.g., the M3 tripod or armored HMMWV. Assessments conducted by Project Metropolis concluded that any further assessments would require the M3M manufacturer to design and build a traversing and elevation (T&E) component integrated into the M3M gun and cradle. Currently the Lab is contracting with FN Herstal to design and build a T&E. Once the T&E is received additional assessments will commence.

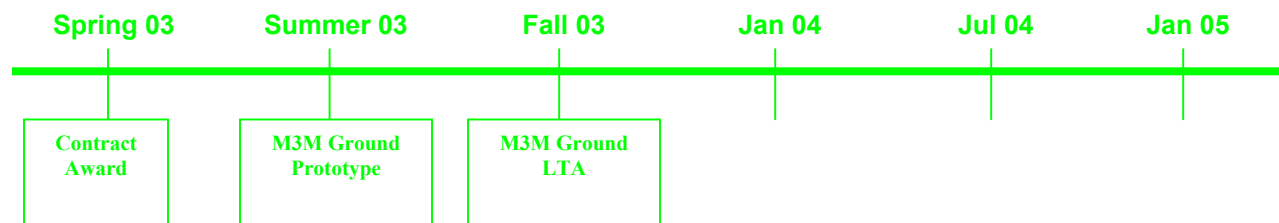


Description: The M3M Heavy Machine Gun is an experimental .50 caliber System modified for ground use from the M3M Air System designed for helicopters with the following characteristics:

- Maximum Range 6500 meters
- Maximum Effective Range 1850 meters
- Firing Rate 850 + rpm
- Total Weight 78.9 lbs

Deliverable Product(s): Prototypes for operational experimentation and requirements documentation.

Milestones:



Action Officer: (703) 784-3425

Mobile Counter Fire System (MCFS)

Purpose: Develop a counter sniper capability that can improve force protection in urban settings. MCFS will augment force protection by providing a capability to immediately detect sniper fire, identify the location from which a sniper is shooting, and depending on the system configuration to return accurate fire.

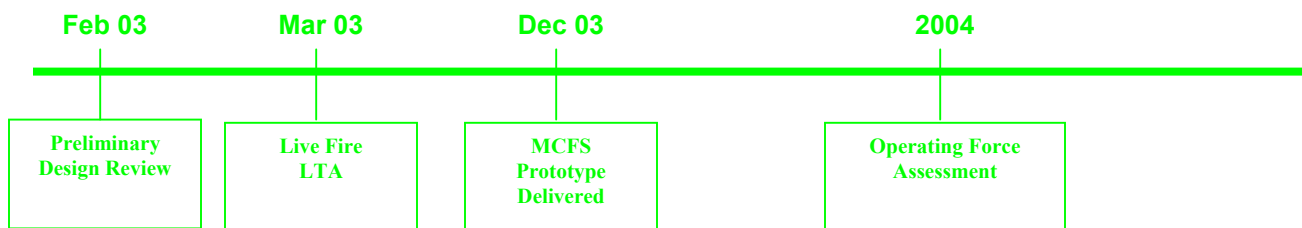
Background: The Marine Corps has a need to provide the war fighter a means of detecting the origin of incoming sniper fire. Technological advances in acoustic sensors, computer analysis of sound signatures, and integration of robotics are available to produce sniper detection and counter-sniper prototypes for operating force experimentation. If successful, the long-term goal would be to migrate parts of the technology (especially the sensor package) to other Program of Record vehicle platforms.



Description: The current MCFS prototype consists of a High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) mounted with an acoustic sniper gunfire detection system capable of operating in a fixed position. The system has the capability of slewing a roof-mounted gun at the sniper's position and to automatically track the aim point for final aiming and return fire. Experimentation will consist of limited technical assessments of an advanced prototype in live fire scenarios. The intent is to develop a technologically mature capability set (system prototype) that can be used in extensive operational assessments in order to refine Mission Needs for insertion into the Expeditionary Force Development Process.

Deliverable Product(s): Prototype for operational assessment and requirements documentation.

Milestones:



Action Officer: (703) 784-3425

Project Metropolis

Purpose: Project Metropolis has a four-fold purpose: (1) Develop TTPs to enable Marines to fight and win in MOUT with reduced casualties. (2) Develop a comprehensive urban warfighting Program of Instruction. (3) Recommend improvements to existing and future training facilities. (4) Evaluate selected enabling technologies that enhance small unit combat capability.

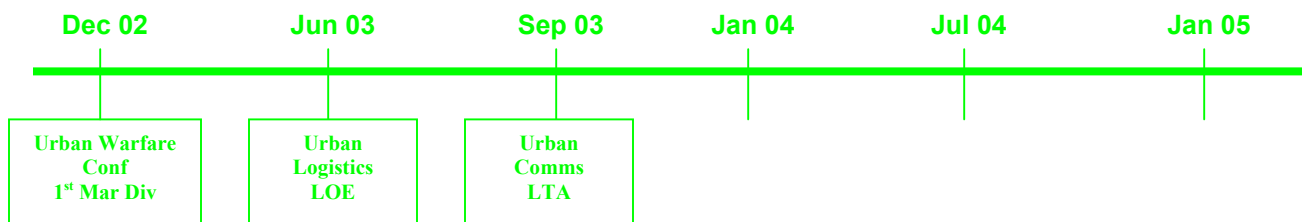
Background: MCWL began examining the urban environment in 1997 as part of the Urban Warrior series of experiments. Unable to accomplish all the objectives and finding that the Marine Corps faced profound challenges regarding training, techniques, tactics and procedures as well as technological and equipment shortfalls Project Metropolis was formed in June '99. Project Metropolis evolved into the repository for urban expertise in the Marine Corps. It has resulted in a wholesale revision of urban doctrine that is still underway and continues to uncover shortfalls and responded to those identified by the advocates and the operating forces. It has been designated as the lead agent for the Marine Corps regarding participation with the Joint Urban Operations Cell at JFCOM. Project Metropolis has become the umbrella organization under which a series of projects have formed.



Description: Project Metropolis experimentation systematically identifies weaknesses or problem areas across the spectrum of urban operations and designs experiments in order to find solutions. Project Metropolis partners with operating force units to conduct experiments at the platoon through battalion (reinforced) level. Experimentation is accomplished across all spectrums of conflict with symmetric and asymmetric threats in both high and low intensity combat environments. Project Metropolis takes a holistic approach to finding ways to prepare for the “three block war”.

Deliverable Product(s): Urban Warfighting Program of Instruction and TTPs, Assessment of Urban Training Facilities, and technology assessments.

Milestones:



Project Rifleman

Purpose: Enhance the warfighting capability of the individual rifleman by conducting experimentation to assess the effectiveness of emerging equipment and technology.

Background: Project Rifleman has evolved into an experimental test bed for near term initiatives requested through the advocates. Project Rifleman also assists the Marine Corps Systems Command's, Marine Enhancement Program, to make procurement decisions by defining concepts through experimentation.

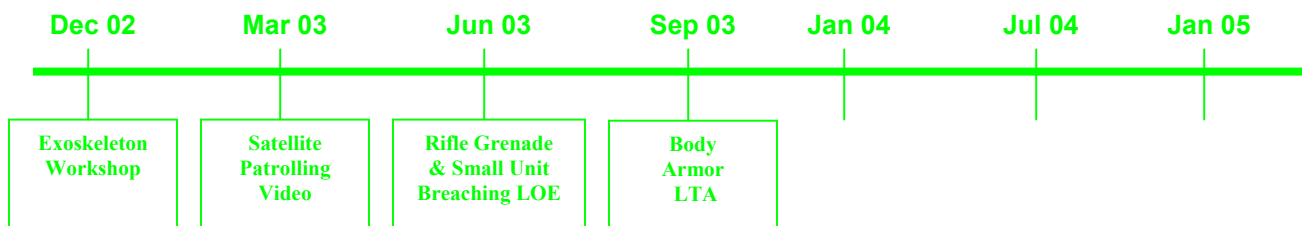
Description: Based on input from the operating forces and advocates, Project Rifleman is focused on experimentation aimed at:

- Identifying a more robust platoon level breaching capability.
- Examining the effectiveness of a family of rifle grenades spread throughout the squad vice designated grenadiers operating the M-203.
- Examining emerging ballistic protection technology.
- Develop a visual training aid for urban patrolling techniques in partnership with Naval Surface Warfare Center, Dahlgren.
- Examine the utility of a vehicle mounted upper-story entry device.
- Examine the utility of a variety of training devices to make experimentation more realistic (paint grenades, claymores, mortars).
- Assist Center for Strategic and Budgetary Assessments in the development of exoskeleton technology.



Deliverable Product(s): Technology assessments and supporting TTPs.

Milestones:



Action Officer: (703) 784-3785

Project Reconnaissance, Surveillance, Targeting Acquisition (RSTA)

Purpose: Develop a reconnaissance, surveillance and target acquisition network that supports the warfighter.

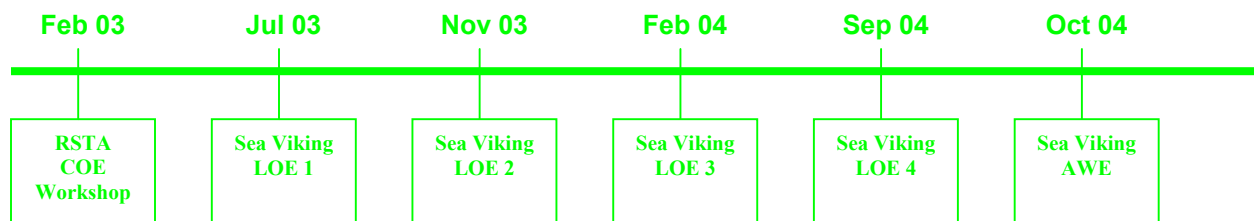
Background: The Marine Corps continues to develop and enhance its capability to conduct maneuver warfare from a seabase. Our philosophy of maneuver warfare will rely heavily on finding and exploiting gaps in order to achieve operational objectives. Enhanced RSTA is a key capability that will enable Marine forces to attack from far at sea, deep inland with highly maneuverable and widely dispersed tactical elements imbued with commander's intent and empowered to make independent decisions. Project RSTA is the umbrella project that integrates the development of a sensor grid and its various forms of sensor components into a coherent tactically relevant system. The sensor grid is composed of all available sensors in the battlespace – human, automated sensors, and unmanned ground and aerial vehicles. The information gained about the battlespace from this grid will be translated into the common tactical picture— a near-real-time graphic representation of the RSTA Grid - a battlefield "picture" that will enable enhanced situational awareness, a common understanding of the battlespace among Marine Air Ground Task Force units and commanders, and improved decision-making.



Description: Project RSTA's focus of effort is to develop a RSTA Concept of Employment (COE) & TTPs in support of STOM. The RSTA Team will develop the RSTA COE that includes organization and TTPs for MEU and Battalion RSTA assets. The COE covers current Marine sensors as well as Navy, Joint and National sensor capabilities that will be available to support a deploying MEU. The COE will also include experimental Marine Reconnaissance technologies and Unattended Ground Sensors (UGS) that will be integrated into the Lab's Expeditionary Tactical Communications System (ETCS) to transmit sensor reports to a sea-based COC via an Iridium netted Over-the-Horizon (OTH) communications system.

Deliverable Products: MEU and Battalion RSTA Concepts of Employment, supporting programs of instructions and TTPs for UGS and reconnaissance technologies.

Milestones:



Action Officer: (703) 784-5170

Precision Target Acquisition, Mobile (PTAM)

Purpose: PTAM supports target location, designation, and handoff by developing emerging technologies, to enable indirect fires observers to use a mobile platform to simultaneously attack targets using close air support, naval surface fires, and ground fires.

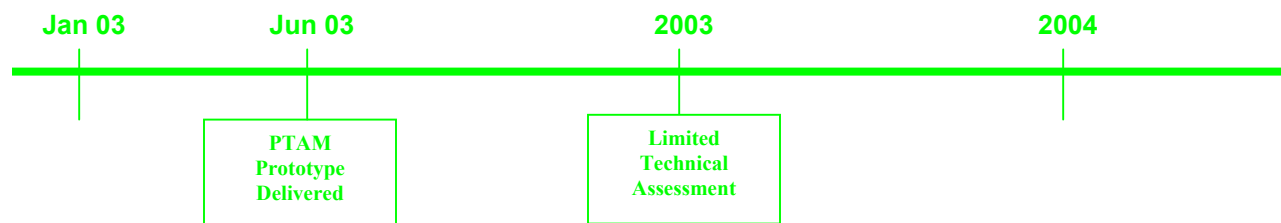
Background: Ground forces need a means to provide reliably accurate target location information in digital format to supporting arms agencies in order to capitalize on the precision munitions that are becoming the backbone of fire support systems. This is particularly true for mounted forces that must be capable of rapidly obtaining target location and directing fires before they become targeted themselves. This system provides precision targeting capability on a mobile platform -- such as the Interim Fast Attack Vehicle (IFAV) – but applicable to many other vehicle platforms. This effort assists the development of a demonstrable technology capable of meeting the requirements of the TLDHS ORD with technology developed to adapt to a mobile platform. This capability was noted in the Artillery OAG Priority for Technology Development list, January 2001.



Description: The system uses a derivation of the Target Handoff System (Experimental) that employs an inertial navigation gyro for greater precision. It is compatible with Advanced Field Artillery Tactical Data System fire support coordination systems and with advanced target hand-off system equipped tactical aircraft. Experimentation will consist of a series of limited technical assessments (LTAs) and a concept demonstrator to include live fire by operating forces. After the assessment process, transition will occur in several ways. First, we anticipate drafting a universal needs statement (UNS). Second, technology transition can occur based on a joint decision by Marine Corps Systems Command and the Combat Development Command.

Deliverable Product(s): Prototypes for operational assessment and requirements documentation.

Milestones:



Action Officer:(703) 784-3425

SQUAD ADVANCED MARKSMAN (RIFLE)

Purpose: The Squad Advanced Marksman Rifle (SAM-R) will give Marines the capability to provide precision fire in support of the rifle squad, provide precision fires in support of an assault, and aid in the observation and adjusting of supporting arms.

Background: Riflemen are trained to engage high-contrast black and white targets with the M16A2 service rifle at ranges out to 500 yards. Riflemen have great difficulty identifying partially camouflaged or concealed targets at half of this distance, with the naked eye in low-light conditions. Additionally, this limitation makes it difficult for rifleman to distinguish combatants from non-combatants and hinders their ability to prioritize, identify or engage high payoff targets within groups with the standard service rifle using iron sights. Rifle squads have no optical equipment to observe the effects of their fires or note mil values in relation to other Marines (to determine precisely when to shift and cease-fire in assaults). Units may find it necessary to serve as a support or assault element at any moment regardless of original assignment. To safely conduct hasty fire and maneuver, units need to be capable of providing adequate suppression to assume either mission and maintain momentum. Using the SAM-R optic will allow the user to accurately and safely provide shifts for machine gun fire and aid in the corrections of call for fire (mortars/artillery).

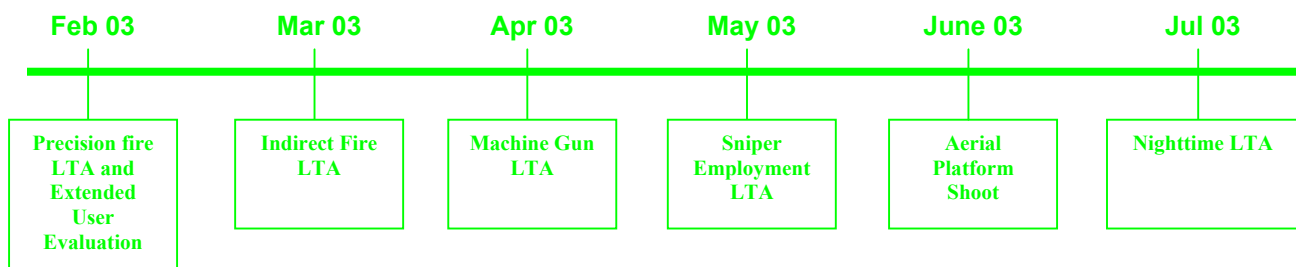


Description: The Lab will assess the SAM-R in the below configuration:

- M-16A4 (flat-top receiver).
- Free floated stainless or chrome-lined match barrel.
- M-16A1 trigger assembly.
- Pop-up front and rear sight assemblies.
- 3.5 x 9 variable power scope with a first focal plane reticle.

Deliverable Product(s): Assessment reports and requirement documentation.

Milestones:



Action Officer: (703) 784-0056

Tactical Warrior

Purpose. Tactical Warrior experiments examine the introduction a variety of enhanced capabilities to infantry small units.

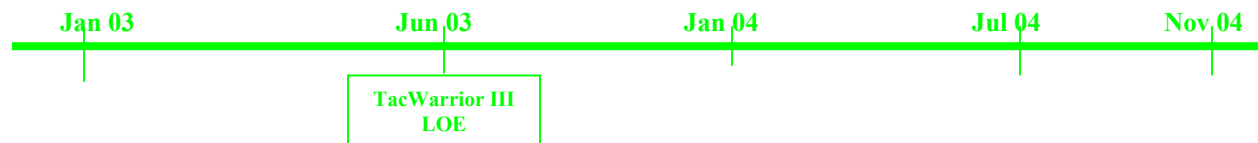
Background: The rise in power of the advocacy process within the Marine Corps has created a need to respond quickly and concisely to operating force needs. The Tactical Warrior experiments help define concepts and requirements as well as experiment with new equipment and technologies. The Tactical Warrior experiments compliment the expeditionary force development process by involving representatives from PP&O, MCSC and TECOM from experiment design through completion, allowing all to benefit from the knowledge attained. The first Tactical Warrior limited objective experiment, TacWarrior I, took place in September '01 and looked at information flow and communications architecture within the rifle platoon. TacWarrior II was completed in October '03 and examined the concept of the Squad Advanced Marksman and continued experimentation with small unit communications integrating the Personal Role Radio (PRR) and PRC-148 radio.



Description: Tactical Warrior experiments are relatively small in scale (company or platoon) and are designed to answer specific questions confronting the GCE in general and the infantry in particular. Tactical Warrior provides the IOAG, Ground Board, TECOM and the advocate at PP&O an experimental venue through which near term capabilities can be examined. It is the Lab's primary vehicle to fight the "near battle" and remain responsive to the operating forces. Although it is not exclusively urban in orientation, a significant portion of the capabilities examined will have an urban context and therefore dovetail nicely with the continuing efforts of Project Metropolis.

Deliverable Product(s): Refined Squad Advanced Marksman concept and assessment reports of a family of rifle grenades and a small unit breaching capability.

Milestones:



Action Officer: (703) 784-3785

Tactical All Terrain Vehicle (TATV)

Purpose: Provide Marine reconnaissance units enhanced mobility for specific reconnaissance, surveillance, and target acquisition missions.

Background: Based on experiences garnered during Operation Enduring Freedom in Afghanistan Marine operating forces have expressed the need for a more suitable light mobile reconnaissance platform to support wide area and high tempo combat operations. Currently, reconnaissance units are limited in their ability to conduct distant and deep mobile reconnaissance to interim fast attack vehicles (IFAV) and motorcycles.



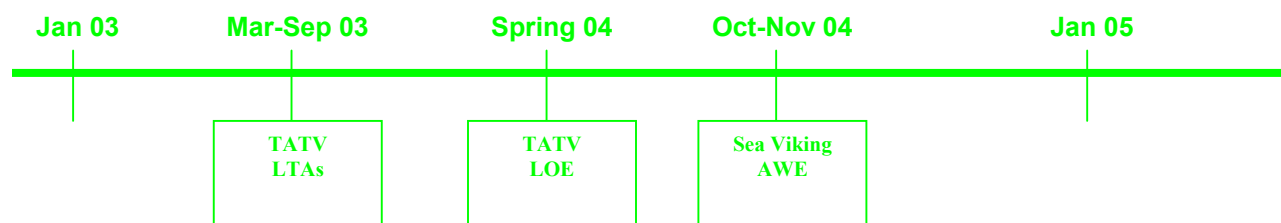
Employment of IFAVs is limited to the CH-53 helicopter and motorcycles have several limitations to the ability to provide stealthy over-watch and security. Motorcycles cannot be ridden with gear due to the lack of balance of the rider. At night a motorcyclist is only concerned with riding the motorcycle to avoid crashing. A light mobile reconnaissance asset that is small enough for employment by the Ch-46 or MV-22 yet able to carry gear would provide a significantly enhanced capability. Additionally, a smaller, stable vehicle would enable effective night operations. If a more flexible, light mobile reconnaissance platform were available, Reconnaissance units would be better able to survey, identify, report, and collect information by rapidly covering a large geographic area. This platform could be used along with the IFAV or independently, based on the mission required.

Description: The Lab will assess the TATV against the below criteria:

- Internally transportable in existing rotary wing assault support aircraft.
- Provide for stable operation while carrying a Marine and all his individual equipment.
- Carry sufficient sustainment to support 7-day operations.
- All wheel drive, all terrain capable with a 600 lbs capacity excluding driver.
- Run on flat tires, towable, and safe to operate at night with Night Vision Goggles.

Deliverable Product(s): Prototype vehicles, universal needs statement, assessment report and requirement documentation.

Milestones:



Action Officer:(703) 784-0056

EXPLOITATION OF EXPERIMENTATION

Background

There is no point in experimenting if the Lab does not impact decisions about future capabilities. Accordingly, developing the products that articulate the results of experimentation – and ensuring that those products are distributed to the right audience – is as important as conducting the experiment in the first place.

If the paperwork is not done and delivered to the right decision maker to effect change in warfighting capability, there is no point in having conducted the experiment in the first place.

Experimentation successes must have a reasonable chance of leading to a recommendation that can be incorporated into future capabilities. Accordingly, in most cases experiments are performed in partnership with a Warfighting Advocate or an agency within the Expeditionary Force Development System (EFDS) such as Training and Education Command or Marine Corps Systems Command intended to lead directly into an implementable recommendation.

Exploitation

The Job's Not Over Until the Paper Work is Done and the Decision is Made. Once the live experiment is over, the last debrief has been conducted, and the last data form has been filled out and collected, the experimentation process has only just begun. The data that has been collected undergoes analysis and the results are documented and fed back to the warfighters and the EFDS to support decisions about what should become

of the experimental tactics, techniques, procedures (TTPs) and technologies. This analysis and assessment process can take months to complete.

Even after the analysis and assessment reports are prepared, institutional acceptance of the results of experimentation may require extensive follow-up efforts. Experimentation results, whether they are favorable or “no go”, should impact force development decisions.

To fully leverage the results of experimentation requires a concerted effort to educate and inform various audiences. Explaining experimental failures is as important as explaining experimental successes. Failure in experiments indicates that the Lab is pushing the envelope on capabilities and that it is honest in its assessments. Identifying ideas for capabilities that do not work is important to close out programs and efforts so resources can be used in other areas that have more potential for success.

The Lab documents its results in six primary ways:

- *The Command Brief*
http://www.mcwl.quantico.usmc.mil/documents/commandbrief_files/slide0001.htm
- *The Experimentation Campaign Plan*–
<http://www.mcwl.quantico.usmc.mil/explancampaignplan.html>
- *Analysis Reports* – Prepared by Analysis Branch
- *Assessment Reports* – Prepared by Experiment Operations Division
- *X-Files* – Prepared by the Synthesis Center ([see next page](#))
- *Products* (Draft UNS/MNS/ORDs, prototype equipment, Programs of Instruction, etc.) – Prepared by Experiment Technology Division or Project Teams.

The Lab prepares specific products to *shape the battlefield* of public opinion both within and without the Marine Corps through an active Public Affairs program with the media, informative sessions with official visitors and by distributing products like a web site, brochures, CDs, and briefs that can be used to keep Marines informed.

Fundamentally, the responsibility to tell the experimentation story is shared by all members of the Lab. Each member should be prepared to distribute Lab products and discuss the Lab's ongoing experimentation efforts.

X-Files

X-Files are pocket-sized, pamphlets containing useful, clear information that can be quickly read. They convey a synthesis of learning from experiments on MOUT tactics, techniques, and procedures and also some enabling technologies that can help Marines fight and win battles on urban terrain.

They represent an evolving body of knowledge that will be refined and inserted into the EFDS when experiments are concluded.

The X-Files use post-training analysis and feedback from Marines. They are not doctrine, nor are they Standing Operating Procedures (SOPs). They are widely distributed to the Marine Corps to include the Operating Forces and selected Marine Corps Schools. They are also available for download from the Lab's web site at: www.mcwl.quantico.usmc.mil.

X-Files Available on the Web Site:

[MCWL X-File 3-35.1](#) -- Urban Attack

[MCWL X-File 3-35.2](#) -- Combat Squad
Leader Decision Making

[MCWL X-File 3-35.5](#) -- Urban Defense

[MCWL X-File 3-35.6](#) -- Urban Patrolling

[MCWL X-File 3-35.7](#) -- Security Operations

[MCWL X-File 3-35.8](#) -- Combined Arms

[MCWL X-File 3-35.11](#) -- Humanitarian Assistance
and Disaster Relief Assessments (**Not Restricted**)

[MCWL X-File 3-35.12](#) -- Urban Sustainability

[MCWL X-File 3-35.13](#) -- Tactical Instrumentation

[MCWL X-File 3-15.31](#) -- Designated Marksman

[MCWL X-File 3-35.35](#) -- Intra Squad Radio

[MCWL X-File 3-33.63](#) -- Humanitarian Assistance
and Disaster Relief Operations (**Not Restricted**)

[MCWL X-File 3-35.21](#) -- Cliff Assault

[MCWL X-File 3-35.37](#) -- Squad and Platoon
Combined-Arm Teams in MOUT

[MCWL X-File 3-35.11](#) -- Small Unit Support
Vehicle (SUSV)

[MCWL X-File 5-12X](#) -- Experimentation
Procedures

EXPERIMENTATION CAMPAIGN PLAN -- 2003

GLOSSARY

ACA	Aircraft Coordination Airspace
ACASS	Advanced Close Air Support System
ACE	Aviation Combat Element
ACTD	Advanced Concept Technology Demonstration
AD/C CD	Assistant Deputy Commandant Combat Development
AFATDS	Advanced Field Artillery Tactical Data System
AFB	Air Force Base
AJC2	Adaptive Joint Command and Control
ARG	Amphibious Ready Group
AT	Anti-Terrorism
ATA	Airborne Target Acquisition
ATF	Amphibious Task Force
AWE	Advanced Warfighting Experiment
BAA	Broad Agency Announcement
BLOS	Beyond Line of Sight
BLT	Battalion Landing Team
BUST	Basic Urban Skills Training
C2	Command and Control
C2IT	Command, Control and Information Technology
C2PC	Command and Control Personal Computer
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CAS	Close Air Support
CCIR	Commander's Critical Information Requirements
CDR	Combat Decision Range
CDS	Combat Development System
CE	Command Element
CECOM	Communications-Electronics Command
CETO	Center for Emerging Threats and Opportunities
CID	Combat Identification
CINC	Commander-in-Chief
CJCS	Chairman of the Joint Chiefs of Staff
CMC	Commandant of the Marine Corps
COA	Course of Action
COC	Combat Operations Center
CONUS	Continental United States
COTS	Commercial of the Shelf
CPLAN	Campaign Plan
CROP	Common Relevant Operational Picture
CSSE	Combat Service Support Element
CSW	Coalition Special Warfare

EXPERIMENTATION CAMPAIGN PLAN -- 2003

CTP	Common Tactical Picture
CVBG	Carrier Battle Group
D/C CD	Deputy Commandant Combat Development
DACT	Data Automated Communications Terminal
DARPA	Defense Advanced Research Projects Agency
DASC	Direct Air Support Center
DISN	Defense Information System Network
DoD	Department of Defense
DOTMLPF	Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities
EBO	Effects Based Operations
ECOC	Experimental Combat Operations Center
ECP	Experimentation Campaign Plan
EFDS	Expeditionary Force Development System
EFSS	Expeditionary Fire Support System
ELB	Extending the Littoral Battlespace
EMW	Expeditionary Maneuver Warfare
EPLRS	Enhanced Position Reporting Location System
ESG	Expeditionary Sensor Grid
ETALS	Enhanced Target Acquisition and Locating System
EUT	End User Terminal
FAC	Forward Air Controller
FAM	Familiarization
FCS	Future Combat System
FIE	Fly-In-Echelon
FM	Frequency Modulation
FO	Forward Observer
FORP	Forward Observer Review Panel
FSSG	Force Service Support Group
FTUV	Family of Tactical Unmanned Vehicles
FY	Fiscal Year
FYDP	Five Year Defense Plan
GCE	Ground Combat Element
GOTS	Government of the Shelf
GPS	Global Positioning System
HIMARS	High Mobility Artillery Rocket System
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HSV	High Speed Vessel
I&E	Innovation and Experimentation
IACCC or IAC3	Improved Airborne Command and Control Capability
IAS	Intelligence Analysis System
ICBT	Interim Brigade Combat Team
IFAV	Interim Fast Attack Vehicle
IMMACCS	Integrated Marine Corps Multi-Agent Command &Control System
IP	Internet Protocols

EXPERIMENTATION CAMPAIGN PLAN -- 2003

IPB	Intelligence Preparation of the Battlefield
IPR	Intra Platoon Radio
IPT	Integrated Process Team
ISR	Intra Squad Radio
ISR	Intelligence, Surveillance and Reconnaissance
ISURSS	Interim Small Unit Remote Sensor System
ITV	Internally Transportable Vehicle
JCDE	Joint Concept Development and Experimentation
JCIET	Joint Combat Identification Evaluation Team
JFC	Joint Force Commander
JFMCC	Joint Force Maritime Component Command
JIMP	Joint Vision Implementation Master Plan
JIP	Joint Interactive Planning
JOA	Joint Operations Area
JOC	Joint Operations Center
JRB	Joint Requirements Board
JROC	Joint Requirements Oversight Council
JSIR	Joint Intelligence, Surveillance and Reconnaissance
JTFHQ	Joint Task Force Headquarters
JTRS	Joint Tactical Radio System
JV2020	Joint Vision 2020
JWCA	Joint Warfighting Capabilities Assessment
LAS	Local Area Sensors
LAV	Light Armored Vehicle
LCAC	Landing Craft Air Cushioned
LEO	Low Earth Orbit
LFOC	Landing Force Operations Center
LOE	Limited Objective Experiment
LOI	Letter of Instruction
LPP	Littoral Penetration Point
LTA	Limited Technical Assessment
M4 MWS	M4 Modular Weapons System
MAA	Mission Area Analysis
MAGTF	Marine Air Ground Task Force
MARCORSYSCOM	Marine Corps Systems Command
MARFORPAC	Marine Forces Pacific
MAWTS	Marine Aviation and Weapons Tactics Squadron
MBC	Mortar Ballistic Computer
MBITR	Multiband Inter/Intra Team Radio
MC	Millennium Challenge
MCCDC	Marine Corps Combat Development Command
MCIA	Marine Corps Intelligence Activity
MCOTEA	Marine Corps Operational Test and Evaluation Activity
MCSC	Marine Corps Systems Command
MCSIT	Multiple C4I IMMAGCS Translator

EXPERIMENTATION CAMPAIGN PLAN -- 2003

MCWL	Marine Corps Warfighting Lab
MD	Millennium Dragon
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEFFV	MAGTF Expeditionary Family of Fighting Vehicles
MELIOS	Mini Eye Safe Laser Infrared Observation Set
MEO	Mid Earth Orbit
MEU	Marine Expeditionary Unit
MFSS	Mobile Fire Support System
MNS	Mission Needs Statement
MOUT	Military Operations in Urban Terrain
MP SIDS	Man Packable Secondary Imagery Dissemination System
MPF	Maritime Prepositioning Force
MPF(F)	Maritime Prepositioning Force, Future
MPSRON	Maritime Prepositioning Squadron
MROC	Marine Corps Requirements Oversight Council
MSBL	MAGTF C4I Software Baseline
MTVR	Medium Tactical Vehicle Replacement
MWS	Modular Weapons System
NAWC-AD	Naval Air Warfare Center Aircraft Division
NOE	Nap of the Earth
NSWC	Naval Surface Warfare Center
OAG	Operational Advisory Group
OC	Olympic Challenge
OCU	Operator Control Unit
OD	Olympic Dragon
ONA	Operational Net Assessment
ONR	Office of Naval Research
OPTEMPO	Operations Tempo
ORD	Operational Requirements Document
OSTI	Office of Science, Technology and Innovation
PC	Pinnacle Challenge
PD	Pinnacle Dragon
PM	Program Manager
POI	Program of Instruction
POM	Program Objective Memorandum
PRE-FICCS	PRE First In Command and Control System
PTAM	Precision Target Acquisition Mobile
PWS	Pintle Weapon System
RAP	Rocket Assisted Projectile
RCSS	Robotic Combat Support System
RDO	Rapid Decisive Operations
RHC	Ruggedized Handheld Computer
ROCS	Recon Observation Confirming Sensors
RSTA	Reconnaissance, Surveillance and Target Acquisition

EXPERIMENTATION CAMPAIGN PLAN -- 2003

RSTV	Reconnaissance, Surveillance, Target Acquisition Vehicle Program
RW	Rotary Wing
S&T	Science and Technology
SA	Situational Awareness
SACC	Supporting Arms Coordination Center
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SCLA	Southern California Logistics Airport
SE&I	Systems Engineering and Integration
SECDEF	Secretary of Defense
SINCGARS	Single Channel Ground and Airborne Radio System
SJFHQ	Standing Joint Force Headquarters
SLA	Service Level Agreements
SLEP	Service Life Extension Program
SLOC	Sea Line of Communication
SOC	Special Operations Capable
SPMAGTF(X)	Special Purpose Marine Air Ground Task Force, Experimental
SRS	Standardized Robotic System
STOM	Ship to Objective Maneuver
TACC	Tactical Air Coordination Center (Navy)
TARDEC	Tank Automotive Research, Development and Engineering Center
TCO	Tactical Combat Operations
TECOM	Training and Education Command
THR	Tactical Handheld Radio
TLDHS	Target Location Digital Handoff System
TRADOC	U.S. Army Training and Doctrine Command
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
UCATS	Universal Combined Arms Targeting System
UCAX	Urban Combined Arms Exercise
UGS	Unattended Ground Sensor
UGV	Unmanned Ground Vehicle
UGV/S JPO	UGV Systems Joint Program Office
UHF	Ultra High Frequency
UNS	Universal Needs Statement
UOC	Unit Operations Center
USJFCOM	United States Joint Forces Command
VHF	Very High Frequency
VoIP	Voice over Internet Protocol
VT	Vehicle Teleoperation
WMD	Weapons of Mass Destruction
WTBN	Weapons Training Battalion
WTI	Weapons and Tactics Instructors



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